Conclusion

Application of cleaner production concepts could well be the next major step forward in industrial development in terms of technical and management issues. In CP capacity development, integrating energy efficiency should be part of professional training programmes and the formal academic curriculum. Professional CP training conducted by various international and regional organizations considers these aspects, but too often it focuses on a few selected industrial sectors. Academic curriculum development needs to introduce CP concepts at undergraduate and graduate level. At undergraduate level, concepts need to be incorporated in existing courses. At the graduate level, this could be achieved through a series of specialized CP courses.

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Figure 6
Outline of a course: Principles of Cleaner Production

Description

The objective of this course is to introduce the concept of cleaner production, the role of energy use in industrial and commercial sector establishments, and its implication for the environment. Pollution and energy consumption abatement measures using cleaner production concepts will be explained using mass and energy balance, tools to conduct energy and environmental audits, and water and energy pinch analysis. Cleaner production applications will be presented using case studies from selected industrial applications.

Outline

1. Introduction: industrial and commercial sector development and related energy and environmental issues.
2. Cleaner production, its definition, and its role in the industrial and commercial sector. Link with sustainable production and consumption concepts, life-cycle analysis, extended producer responsibility. Pollution prevention vs. pollution control – overview of cleaner production. Explanation of what pollution control is, and the technologies associated with it; approaches and means of pollution prevention.
3. Energy and environmental parameters/concepts for CP: basic terminology, units, measurement techniques, significance, etc. (BOD, COD, TSS, TDS, colour, etc.).
4. Waste and energy audit methodologies. Application of mass and energy balance in energy and environmental audit, Sankey diagram.
5. Major industrial processes, considering energy and environmental points of view. Identification of major unit processes associated with energy consumption and pollution generation.
6. Pollution prevention through process integration (energy and environment). Process optimization through integrating both energy and environmental aspects. Energy management concepts and measures to improve energy efficiency.
7. Energy and water pinch: an efficient waste minimization tool.
8. Occupational health and safety, quality of product, and other aspects of CP.
9. Financial analysis of CP options: cash flow, payback period, net present value, internal rate of return, profitability index, depreciation, etc.
10. Case studies from industries: pulp and paper, electroplating and cloth washing operations, etc.

El rol de la energía en el desarrollo sustentable: elementos para un análisis de la política energética en Latinoamérica

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Summary

Decision-making concerning the relationships between energy policies and sustainable development should include not only identification of current problems, and examination of future impacts, but also (to increase the probability of success) the active participation of all stakeholders. Because energy policies have very complex environmental implications, it may not be possible to address them adequately using limited technological or systems-oriented approaches.

RÉsumÉ

les prises de décisions concernant les relations politiques energétiques – développement durable ne devraient pas seulement recenser les problèmes actuels et analyser les impacts à venir si l'on veut qu'elles donnent de bons résultats. Elles devraient également inclure dans le processus la participation active de tous les acteurs. Parce que les politiques énergétiques ont des répercussions environnementales très complexes, les approches se limitant aux aspects techniques ou au fonctionnement des systèmes peuvent ne pas convenir pour résoudre ces questions.

Resumen

La toma de decisiones relativas a la relación entre políticas energéticas y desarrollo sostenible deberían incluir no sólo la identificación de los problemas actuales y la evaluación de impactos futuros, sino también la participación activa de todas las partes involucradas para incrementar las probabilidades de éxito de éstas políticas. Ya que toda política energética conlleva unas implicaciones a nivel medioambiental muy complejas, puede ser difícil encontrar soluciones adecuadas usando solamente enfoques limitados a cuestiones tecnológicas o a la operación de sistemas.

La energía como un medio para favorecer el desarrollo sustentable

Las relaciones apropiadas entre la energía y las dimensiones del desarrollo sustentable pueden dar lugar a una serie de implicaciones positivas relativas a su evolución y a sus interacciones.

Al interior de cada dimensión se observan importantes incidencias del sector energético en las distintas dimensiones mencionadas precedentemente (**Figura 1**).

En la economía, afectando su estructura y dinámica con la eficiencia que deriva del tipo de fuentes energéticas empleadas (diversificación), los procesos de transformación (tecnología) y el uso final (uso racional de energía). En lo social satisfaciendo necesidades de la población (cobertura, calidad y confiabilidad de los servicios), proveyendo trabajo y mejorando su capacidad de compra al reducir el costo de la energía en los presupuestos familiares. En lo ambiental, contribuye a una explotación y uso más racional de los recursos naturales (potenciales, reservas, producción, consumo) y atenuación de sus efectos sobre el espacio vital (emisiones locales y globales).

A su vez, las interacciones entre las dimensiones indican: entre *economía y sociedad*, mercados de productos y servicios con diversas características (dimensión, competencia, regulación, costos, movilidad de mano de obra); entre la economía con los *recursos naturales*, la necesidad de considerar su valor económico (agotamiento, erosión y depredación) y; entre la economía *con el ambiente*, una mayor conciencia sobre el deterioro del espacio vital productivo (contaminación y efecto invernadero). A su vez, la relación entre *sociedad y ambiente*, indica efectos sobre el espacio vital de las personas, entre otras, por uso de leña y otras energías de baja calidad.

La intensidad de la interacción de la energía con o entre las dimensiones pone de relieve las fortalezas o carencias, riesgos y vulnerabilidades del proceso de desarrollo (Figura 1).

El análisis de esas dimensiones y sus interacciones posibilita identificar, además del estado, la evolución probable de las relaciones entre las políticas específicas del sector energía y los objetivos del desarrollo sustentable en varios niveles: institucional (Gobierno Central, Estados o Provincias, Municipios), en el espacio (nacional o internacional) y en el tiempo (corto y largo plazo).

A nivel institucional, las políticas implican decisiones que tendrán efectos hacia arriba o hacia abajo en la escala de gobierno, dependiendo del ámbito de decisión. La estructura del sistema de decisión (grado de descentralización) suele ser determinante de la efectividad de la política. Se advierte en ese proceso la necesidad de asignar a los municipios un rol sustantivo en las decisiones de política energética a partir de la regulación del uso de la energía en su ámbito, urbano y rural, por sectores socioeconómicos (industrial, comercial, residencial) para que favorezcan el ahorro de energía. Por ejemplo, mediante un adecuado manejo del transporte público de pasajeros (distancia entre paradas, antigüedad y estado de los vehículos), normando la distribución de cargas para los comercios (recorridos) o, estableciendo reglamentos sobre materiales de construcción (aislantes) de acuerdo al clima para las obras que autoriza. Con relación a la dimensión social y ambiental, regulando las actividades que producen emisiones y residuos.

A nivel espacial, las políticas energéticas pueden afectar regiones identificables por límites políticos o ecosistemas menores o más amplios que aquellos. De modo que las políticas deben guardar un equilibrio espacial en la satisfacción de las necesidades. Los países con grandes diferencias socioeconómicas regionales requieren identificar acciones derivadas de la política que reduzcan esas brechas en las distintas dimensiones del desarrollo sustentable. Por ejemplo, los consumos de leña discriminados por regiones son bastante representativos de esa situación y sugieren políticas de sustitución acompañadas de medidas que posibiliten la penetración de las energías comerciales junto con tecnologías que permitan un uso más eficiente de la leña donde no pueden penetrar esas energías.

A nivel temporal, las políticas energéticas pueden también compatibilizar las posibilidades de satisfacción de las necesidades de las generaciones presentes con las de las generaciones futuras a partir del equilibrio entre la explotación, transformación y uso de los recursos naturales minimizando sus impactos sobre el ambiente local y global. Por ejemplo, el suministro de energía a largo plazo con fuentes no renovables sólo puede ser asegurado mediante una adecuada evaluación del riesgo de que los recursos requeridos puedan estar presentes.

El estado y evolución del desarrollo sustentable puede ser identificado mediante indicadores (**Figura 2**) que posibilitan determinar los aspectos

fuertes y débiles de las políticas implementadas en el pasado, así como sugerir las acciones que permitan mejorar el desempeño futuro en las distintas dimensiones que relacionan energía y desarrollo sustentable [OLADE/CEPAL/GTZ, 1997].

Los procesos de modernización energética que se observan en la región han incorporado muchos de los aspectos señalados pero aún faltan implementar reformas sistemáticas en varios países y profundizar los esfuerzos en otros con el fin de reforzar el proceso de desarrollo sustentable. Ese proceso es posible en la medida que se advierta la necesidad de fomentar inversiones dentro de una concepción global del desarrollo.

Inversión y desarrollo sustentable

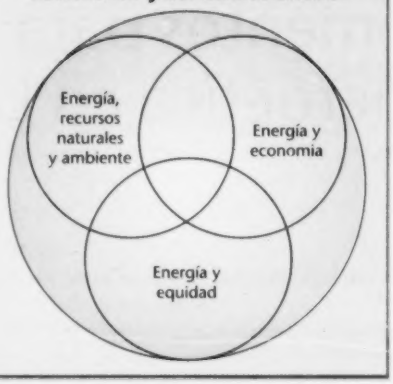
El proceso de formación de capital es la base de la dinámica del desarrollo. Desde esa perspectiva, para favorecer el desarrollo sustentable, se requiere tender a un equilibrio entre todas las formas de capital. Ello supone revalorizar las otras formas de capital *(natural, social* y *humano)* como complemento del tradicional *capital fijo* reproducible por la actividad económica. Pero, la reposición y expansión de las distintas formas de capital requiere también que la asignación de inversiones se realice al menos sin deteriorar alguna de ellas de modo que al equilibrarse tiendan a fortalecer el crecimiento económico, la equidad social y la protección de los recursos naturales y el ambiente [OLADE/CEPAL/GTZ, 2000].

Sin embargo, la racionalidad de los decisores, públicos y privados, que movilizan las inversiones depende de distintos factores. Normalmente el sector privado se orienta a invertir en *capital fijo* reproducible y en gran parte del *capital natural*, en particular el no renovable como los hidrocarburos, cuando los *precios* y las *tasas de interés* inducen a una rentabilidad satisfactoria con relación al riesgo que están dispuestos a aceptar.

Por su parte, la inversión en el resto del *capital natural* y en gran parte del *capital social*, que hacen al hábitat de las personas y mejoran su calidad de vida, no genera una *rentabilidad* tangible inmediata y por lo tanto difícilmente induce a una preferencia de la inversión privada. En consecuencia, en las economías de mercado esas inversiones, cuando son reconocidas como necesarias para los sectores más pobres, recaen sobre las funciones subsidiarias del Estado. No obstante, la *rentabilidad* que deriva de esas inversiones se evidencia cuando las distintas formas de capital alcanzan un adecuado balance, aspecto que se manifiesta preponderantemente en la calidad del *capital humano* de cada país.

Los procesos de modernización en América Latina y el Caribe, observados en la década pasada, han cambiado la organización institucional del sector energético. Las tendencias se han orientado a modificar el régimen de propiedad, facilitar el libre comercio, descentralizar las instituciones hacia adentro de los países y a integrarlos comercialmente hacia afuera, ordenar y regular monopolios naturales y en general a adoptar políticas energéticas pasivas hacia aquellas actividades que podían ser reguladas por el mercado.

Figura 1
Dimensiones del desarrollo sustentable y sus interrelaciones



Sin embargo, en las áreas que se han abierto a la competencia el proceso se ha desarrollado básicamente por *proyectos*. Los resultados, en los países en donde los cambios han sido más profundos, indican en general mejoras en el aumento de la eficiencia productiva y en la calidad y confiabilidad del suministro energético a corto y mediano plazo. Pero, debe reconocerse que el proceso por *proyectos* no tiene una orientación económica, sino financiera, y por lo tanto no busca explícitamente asignar inversiones para alcanzar objetivos de bienestar ni de suministro energético a largo plazo. En todo caso, la coordinación para orientar el bienestar de las generaciones presentes y futuras y lograr un suministro energético sostenible a largo plazo con tecnologías limpias sigue siendo una responsabilidad del Estado, aunque bajo otras condiciones dado el cambio de contexto. Al parecer, con un fomento activo de una política energética, acompañada de una correlativa política fiscal, que estimule una determinada relación de precios finales de la energía se pueden satisfacer los objetivos de largo plazo promoviendo la reasignación de inversiones en las industrias energéticas y compatibilizando intereses entre los diversos actores de la sociedad para construir la viabilidad de la política.

También, hay otros aspectos que son afectados por los precios de la energía y que se relacionan con el agotamiento y explotación de los recursos naturales, los rendimientos de los equipos en los diversos usos y las emisiones y desechos que impactan sobre el ambiente y la calidad de vida en el hábitat de las personas.

Energía, calidad de vida y ambiente

El objetivo del desarrollo sustentable es la satisfacción de las necesidades de las personas. Sin embargo, en las distintas dimensiones y sus intersecciones aparece un factor conducente de las necesidades. Las necesidades no son solo determinadas por cuestiones biológicas o funcionales sino también por cuestiones culturales. El equilibrio entre esas cuestiones define la calidad de vida de cada país.

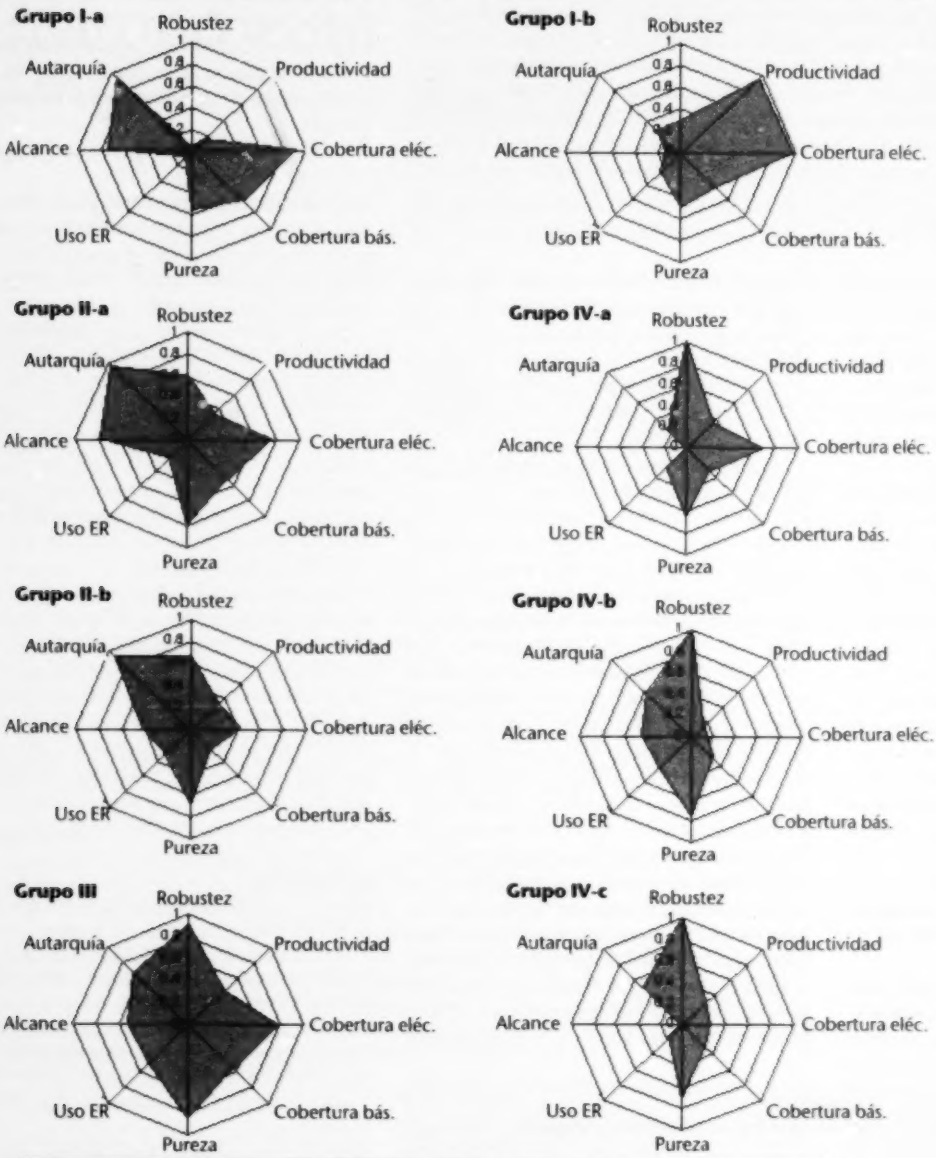
Existe en algunas sociedades la idea parcial y bastante generalizada de que quien consume más está mejor. Esa racionalidad sugiere un estilo de vida que se basa en que el crecimiento del consumo de energía supuestamente también favorece la calidad de vida. Esta concepción se advierte en las conclusiones que suelen extraerse a partir de las comparaciones que se realizan entre los consumos de los países o entre estratos de la población de un país.

Los bajos niveles relativos del consumo de energía per capita dentro de América Latina y el Caribe (ALC) indican, por una parte que la cobertura de los requerimientos energéticos básicos de la población dista de haber alcanzado un nivel aceptable en la mayor parte de los países y por otra, están mostrando fuertes desequilibrios en la cantidad y calidad de los consumos por las asimetrías sociales. Dentro de la concepción del párrafo anterior los menores consumos promedio de ALC efectivamente muestran una menor calidad de vida respecto a los países industrializados y una desigual calidad de vida entre ellos. La cuestión es si la reducción de las comparaciones al parámetro mencionado es suficientemente válida.

Por otra parte, el concepto adoptado de desarrollo sustentable identificaría a la calidad de vida como un valor mientras que al estilo de vida como un medio conducente en una dirección que puede o no ser sustentable. Por ejemplo, en algunos ámbitos de los países industrializados, la preocupación por el ambiente les lleva a preguntarse qué pasaría con el mismo si los países en desarrollo alcanzaran, por emular su estilo de vida, mayores niveles de consumo. Las conclusiones que suelen extraer son que la tierra no soportaría mejoras en sus condiciones de vida [Vorholz F., 1995, Mack G., 1996]. Por ello, en otros ámbitos se sugieren cambios en el "estilo de vida", que parece ser el factor donde pivotean estas preocupaciones. Sin embargo, en esos países, el elevado consumo per capita, aún con la disponibilidad de tecnologías más eficientes en las diferentes etapas de las cadenas energéticas, refleja un estilo de vida que presiona fuertemente sobre el clima a través de las emisiones que generan y sobre los recursos naturales de ALC a través de su importación directa.

Para los países de ALC los problemas que se manifiestan, en las grandes ciudades, por emular el estilo de vida de los países industrializados son análogos pero menos perceptibles por el menor consumo de energía final per capita derivada de sus bajos ingresos promedio (por menor desarrollo) y que conduce debido a una estructura productiva energética menos agresiva (60% de hidroelectricidad) que en muchos países industrializados a un reducido impacto ambiental (5% de las emisiones de CO_2 en el total mundial). Pero, a ello se agrega como otro efecto negativo que un menor consumo de energía útil per capita, por la utilización de tecnologías menos eficientes (**Recuadro 1**) en muchos procesos de transformación y en la mayoría de los usos (**Recuadro 2**), contrarresta las posibilidades de contribuir a un mejor ambiente. Por ejemplo, en los usos de las áreas urbano marginales y rurales de muchos países se releva un importante consumo de leña y de energías de baja calidad por las condiciones de pobreza de gran parte de la población. Por otra parte, los efectos de las emisiones de los recursos naturales que exportan revierten negativamente sobre su propio clima. Por ello, la preocupación en la región es distinta a la de los países industria-

Figura 2
Clasificación de países de ALC mediante indicadores de sustentabilidad energética (1996)



Grupo de indicadores de sustentabilidad energética en ALC

I. Países mono-exportadores (petróleo y derivados) y cobertura eléctrica alta.
a) Con baja productividad
b) Con alta productividad

II. Países exportadores de energía con:
a) cobertura eléctrica medio alta
b) cobertura eléctrica medio baja

III. Países autoabastecidos o con un peso de importaciones relativamente bajo, pero con cobertura variable de necesidades básicas.

IV. Países importadores con:
a) cobertura eléctrica y de necesidades básicas medio alta
b) cobertura eléctrica y de necesidades básicas medio baja
c) eléctrica y de necesidades básicas baja cobertura

Fuente: Energía y Desarrollo Sustentable. Enfoques para la política energética. Proyecto OLADE/CEPAL/GTZ, 1997

Autarquía energética:	baja participación de las importaciones en la oferta energética
Robustez frente a cambios externos:	baja contribución de las exportaciones energéticas al PIB
"Productividad" energética:	alto PBI por unidad de energía
Cobertura eléctrica:	alto porcentaje de hogares electrificados
Cobertura de necesidades energéticas básicas:	suficiente consumo de energía útil residencial
Pureza relativa del uso de energía:	bajos niveles de emisiones (de CO_2)
Uso de energías renovables:	alta participación de energías renovables en la oferta energética

lizados. La cuestión ambiental, tiene otra prioridad aunque en muchos casos se origine en los problemas de pobreza mencionados o en limitaciones al acceso de tecnología más eficiente en la explotación y uso de la energía.

Entonces, debe reconocerse que los efectos de un mayor consumo de energía, que pudieran derivar de una reducción de la pobreza, por un mayor desarrollo de la región, pueden compensarse en gran parte a través de una política energética activa que fomente la utilización de fuentes comerciales y tecnologías energéticamente más eficientes, que sí resultarán en importantes contribuciones a favor del ambiente.

Aunque la explicación de los argumentos es más compleja, las conclusiones a que se arribaría sobre los efectos son los mismos. El círculo vicioso se evidencia en emisiones crecientes en el norte con una capacidad de su absorción en disminución en el sur. La conclusión obvia, para ciertos medios extra-regionales es que el mundo, con ese "estilo de vida", va en la dirección opuesta del desarrollo sustentable. La conclusión, en algunos medios de ALC, reconoce que la cuestión ambiental implica responsabilidades que son compartidas pero que tienen un peso relativo diferente. Y si bien puede admitirse que la deuda ambiental se debe al "estilo de vida", algo tiene que hacer la comunidad internacional para afrontar los costos de esa deuda de acuerdo a su respectiva responsabilidad sobre los impactos que provocan en el patrimonio natural de otros países. En ese contexto, difícilmente puede pensarse en que la región adoptará medidas

Recuadro 1
¿Es posible la eficiencia energética en Latinoamérica?

Los estudios detallados de uso eficiente de energía realizados por OLADE, con apoyo de la Comisión Europea, han demostrado que es posible mejorar significativamente la eficiencia energética en la Región. En América Central se detecta un potencial entre 4% y 9% para ahorro de energía eléctrica y entre 7% y 9% para reducción de los picos. Esto se explica considerando que la Región importa equipos eléctricos sin restricción alguna respecto a su eficiencia o posibilita la instalación de industrias para la fabricación de equipos que no son admitidos por las regulaciones en los países industrializados. Por consiguiente existe una muy baja penetración de equipos eficientes y no existen regulaciones al respecto.

que impliquen un retraso en su ritmo de desarrollo como una respuesta a ese problema.

Por ello, una propuesta que favorezca el desarrollo sustentable es que a través de la política energética se promueva un "estilo de vida" que implique un uso de la energía que mejore la calidad de vida dentro de una concepción ética de la responsabilidad por parte de sus decisores.

Si la propuesta del desarrollo sustentable se asume, en general, como una responsabilidad compartida e ineludible de todos los actores de la sociedad entonces, parece ser bien avenida con el sistema de vida democrático. Mientras éste último establece un mecanismo político de convivencia social en libertad, el desarrollo sustentable promueve un equilibrio en la satisfacción de las necesidades sociales que garantiza precisamente esa convivencia. El aporte de un uso racional y eficiente de la energía así como una explotación responsable de los recursos naturales puede contribuir en muchas dimensiones, incluido el ambiente, a la consolidación de ese proceso en Latinoamérica.

Breves referencias al Programa sobre Energía y Desarrollo Sustentable de OLADE

En América Latina y el Caribe se han venido efectuando, a través de la Organización Latinoamericana de Energía (OLADE), una serie de proyectos, auspiciados por diferentes organismos y agencias internacionales de cooperación y con el apoyo de gobiernos a través de los respectivos Ministerios de Energía e instituciones energéticas de países de la región, destinados a investigar y realizar propuestas de desarrollo sustentable desde la perspectiva energética.

Las actividades más importantes realizadas por el Programa pueden sintetizarse en:

- Desarrollo conceptual y entrenamiento en la formulación de políticas energéticas orientadas a fortalecer criterios de desarrollo sustentable en los países de la región. Estas actividades que tuvieron como antecedentes estudios en Chile, Bolivia, Brasil, Colombia y El Salvador, se concretan en el presente mediante Seminarios en los Países Miembros de OLADE y en Seminarios Subregionales donde los problemas a analizar son específicos (Jamaica, Rep. Dominicana) o comunes a los países integrantes (Comunidad Andina y México, Mercosur y Chile, Centroamérica y el Caribe).
- Identificación de proyectos, binacionales y multinacionales que aseguren el suministro energético a largo plazo en un contexto de desarrollo sustentable. Así, se han realizado estudios de prefactibilidad sobre interconexiones de gas natural desde México hasta Panamá. Se han estudiado los mercados del gas natural en Venezuela, Colombia y Ecuador y sus posibles interconexiones incluidas las de Centroamérica por el sur. Se ha estudiado la prefactibilidad de un proyecto geotérmico bina cional entre Colombia y Ecuador y se está colabo rando en la posible integración energética entr Ecuador y Perú.
- Inventario y análisis de la legislación ambient y recomendaciones sobre política y legislació ambiental para el sector energético de los países d la región.
- Capacitación de post grado en Energía Ambiente.

El enfoque del Programa no es diseñar técnic sino seleccionar y armonizar las existentes d modo de estimular el crecimiento económic propiciar una mayor equidad social y proteger l recursos naturales, entre ellos el ambiente.

En los diversos proyectos se ha recibido el apoy además del propio soporte de los Países Miembr de OLADE, de la cooperación alemana (BMZ GTZ), Naciones Unidas a través de ECLAC UNEP Collaborating Centre on Energy and Env ronment, la cooperación canadiense para un pr grama conjunto con la Universidad de Calgary Energía y Ambiente, la Provincia de Québec desarrollos hidroeléctricos, la Unión Europe (UE), BID y Banco Mundial.

Los autores se han basado en muchos de los trab jos realizados por el Proyecto Energía y Desarrol Sustentable en América Latina y el Caribe ejecutad por OLADE, CEPAL y GTZ y también agradec los comentarios y sugerencias de Paul H. Sudi (GTZ), Carlos E. Suárez (FB) y Héctor Pistoni (IDEE). No obstante, los juicios de valor que advierten en el mismo son de exclusiva responsabil dad de los autores y no comprometen en modo alg no a las personas o instituciones involucradas

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Recuadro 2
Los potenciales de uso racional de energía no se deben extrapolar

Los usos finales con mayor potencial para el ahorro de energía difieren mucho de una localidad a otra en Latinoamérica. La importancia que la cocción eléctrica tiene en Costa Rica, rivaliza con el peso que tiene el aire acondicionado en Managua, Nicaragua o con la participación del calentamiento de agua en Ecuador. Los estudios de caracterización de la carga realizados por OLADE, demuestran que no se deben tomar los potenciales de ahorro de los países industrializados para estimar los potenciales de ahorro de ciudades de Latinoamérica.

Addressing sustainable development in environmental impact assessments

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Summary
This article identifies some of the deficiencies and capabilities of EIA processes in regard to assessing the sustainability of projects and programmes. It suggests ways to correct their deficiencies without major legislative, regulatory or procedural overhaul. The proposed analytic framework bridges the gap between existing EIA guidance in the United States and basic sustainability principles. Within the existing EIA framework, assessments of sustainability can be made explicit, and criteria for impact assessment can be expanded to include identification of non-sustainable losses to natural capital and/or exceedence of thresholds or standards within defined local, regional or even global contexts.

Résumé
L'article recense quelques-uns des avantages et des lacunes des évaluations d'impact sur l'environnement (EIE) utilisées pour évaluer la viabilité des projets et des programmes. Il propose des solutions pour corriger ces lacunes sans bouleversement majeur des législations, règlements ou procédures en vigueur. Le cadre analytique proposé comble le vide entre les informations actuellement disponibles dans ce domaine aux Etats-Unis et les principes élémentaires du développement durable. Dans le cadre actuel des EIE, on pourrait rendre les évaluations de la viabilité environnementale plus précises et élargir les critères d'évaluation des impacts à l'identification des pertes irréparables de capital naturel et au dépassement de seuils ou de normes dans des contextes locaux, régionaux, voire mondiaux, définis.

Resumen
Este artículo identifica algunas de las deficiencias y capacidades del proceso EIA, en lo que atañe a la evaluación de la sustentabilidad de proyectos y programas. Sugiere maneras de corregir sus deficiencias, sin entrar en grandes reformas legislativas, de regulación o de procedimiento. El marco analítico propuesto salva la brecha entre las directrices de EIA vigentes en Estados Unidos y los principios básicos de sustentabilidad. En el marco actual de EIA, es posible realizar evaluaciones explícitas de sustentabilidad, así como establecer criterios para evaluar el impacto medioambiental; ambas pueden ampliarse, para incluir la identificación de las pérdidas de capital natural que atentan contra la sustentabilidad o transgreden los umbrales o estándares en contextos locales, regionales o incluso mundiales.

The United States National Environmental Policy Act (NEPA) was passed in 1969.[1] In 1970, the California Environmental Quality Act (CEQA)[2] became the first of over 30 state-level mini "NEPAs" to be enacted within the US. Similar laws in other countries and territories emerged subsequently. The central requirement of these laws is that the potential environmental impacts of proposed plans, programmes and projects be identified and mitigated before they are implemented. Concerns about long-term sustainability have evolved in recent years, and practitioners of environmental impact assessment (EIA) have begun to question whether sustainability is adequately addressed by existing regulatory and analytic models.

NEPA and CEQA embody both the essence and the substance of sustainability, although the term "sustainable development" was not in use at the time of their inception. Much of the typical analysis in EIAs is consistent with sustainability principles, even if not articulated in so many words. However, the implementation of these substantive policies has been weak. Both practitioners and decision-makers generally ignore or even shy away from opportunities to address sustainability directly and comprehensively.

Deficiencies and capabilities in implementing substantive policies

Most EIA processes, including NEPA and CEQA, are similar and are founded upon statements of environmental polices that herald the concept of sustainability. Although the term "sustainability" does not appear in either CEQA or NEPA, both embody many principles associated with sustainability. These include recognition of ecological limits; the worldwide character of environmental problems; responsibility for meeting the needs of both present and future generations; and commitment to long-term maintenance and restoration of environmental quality. The notion of sustainability is evident in wording such as: "achieve conditions under which man and nature can exist in productive harmony to fulfill social and economic requirements of present and future generations" (both statutes); "attain the widest range of beneficial uses of the environment without degradation, risk to health or safety..." (NEPA); and "identify critical thresholds for the health and safety of the people and take actions to prevent such thresholds being reached..." (CEQA).

Despite these plain statements of the central goals of sustainability, both statutes have fallen short in accomplishing their substantive goals. Deficiencies in EIA practice are now well known. Because EIA is typically project-specific, the scope of analysis tends to be local, small-scale and short-term, constrained by political boundaries, narrow sponsor interests and near-term planning horizons. In the US, the focus of analysis in EIA is on biophysical impacts. It often misses social and economic factors, community values, and other indicators of a sustainable "quality of life." EIA review often begins only after plans have crystallized and real alternatives have been foreclosed. As a "snapshot," the EIA generally presents static and simplistic cause-and-effect relationships, rather than dynamic or adaptive response to impacts that may occur over time. Finally, EIA (especially in the US) is driven more by the *letter* than the *intent* of the law - that is, by standards of legal adequacy ("bullet-proofing" is more important than achieving the best environmental solution).

Both NEPA and CEQA also have statutory limitations on their ability to promote sustainability. Neither provides specific environmental objectives, standards or criteria. These must be drawn from *other* sources. The EIA process does not create new resource-specific environmental protections (compare the Clean Water Act, Clean Air Act, Endangered Species Act, etc.). Instead, as an "umbrella" it covers a multitude of *other* environmental laws, regulations or executive orders, disclosing the extent to which a proposed project does or does not meet implied "standards". Nor can EIA substitute for local or regional plans and policies. Decisions concerning sustainable limits are dependent on deliberate planning on a variety of spatial scales, supported by the political commitment to impose limits or standards. Finally, the focus of both statutes is on proposed "major actions" by government agencies, rather than

minor actions or ongoing programmes.

Despite these limitations, both statutes are capable of addressing sustainability. For example, some local and regional issues are addressed in sustainability terms where capacity limits, health standards or other thresholds have been established, such as emission limits for air quality, water quality standards, or service area capacities for infrastructure. Pre-established thresholds for determining impact significance can provide useful criteria for assessing whether the *implicit aims* of sustainability are met, in that a finding of "significant impacts" suggests that a project will exceed environmental thresholds or other limits unless mitigated.

Larger regional issues are theoretically addressed in cumulative impact assessment, required by both statutes, or in the consideration of growth inducement and its secondary impacts (as required by CEQA). However, cumulative analysis has no practical utility except in relation to permissible limits of ecological or social impact. Strategic Environmental Assessment (SEA), now widely used in other parts of the world, can consider the larger picture; in California, an EIA on local and regional land use plans is the closest equivalent. Programme or Master EIAs of large-scale projects, programmes and policies also provide the opportunity to expand the scope of analysis to include longer planning horizons or broader regions, or to encompass a sequence of elements in a continuing programme. Finally, consideration of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity is required under NEPA (and under only limited circumstances in CEQA), but is treated generically (at best) in EIAs in the US.

With interest in sustainable development growing around the globe, it is revealing to revisit EIAs' substantive deficiencies, as well as capabilities, and to identify ways in which the process could be improved to support more sustainable development. By adjusting the scope and focus of assessment to include specific sustainability criteria, and by adapting known analytic methods, NEPA and CEQA (as well as other EIA statutes and methodologies) could go a long way towards promoting social, economic and environmental sustainability at the plan or project levels that typically receive EIA review. In fact, many criteria in common EIA use can be redefined, through semantic adjustment alone, in terms of sustainability. This requires: 1) defining concepts of sustainability; 2) adapting the existing EIA regulatory framework to encompass these concepts; and 3) adapting the existing methodological frameworks to incorporate sustainability assessment criteria.

Table 1
Principles and processes common to sustainability plans*

Common principles (goals, objectives)

1. Responsibility for future as well as present generations
2. Interdependence of humans and environment (nature)
3. Efficient consumption of renewable natural resources (energy, materials), and maximum recycling, reuse of non-renewable resources
4. Waste elimination within assimilative capacity of environment
5. Protection of ecosystems
6. Integration of economic, environmental and social systems
7. Economic viability and vitality
8. Community and quality of life
9. Healthy human environment
10. Equity, social justice, fair distribution of benefits and burdens
11. Population stabilization (expressed in local plans as "growth management")

Common processes (strategies, actions) for developing sustainability plans

1. Interdisciplinary, systems approach to managing resources, planning communities
2. Collaborative, participatory process
3. Changes required in attitudes, culture, behaviour
4. Modification of market economy (e.g. life-cycle cost accounting, pollution pricing, incentives)
5. Appropriate or adaptive technologies and products
6. Local initiative, diverse responsibilities (e.g. government, NGOs, local business, citizens)
7. Environmental education, information exchange
8. Structure/purpose - alternative future scenarios, strategies, goals, targets, actions
9. Variable scale of human activities: temporal (short-term, long-term), spatial (local, regional, global)
10. Legislative and regulatory framework, planning tools to support initiatives
11. Assessment of environmental impacts (EIA)
12. Indicators to measure attainment of targets
13. Foster stewardship worldview

* Derived from a variety of published and Internet sources.

Defining concepts of sustainability

To redirect EIA analysis towards the assessment of sustainability requires incorporating sustainability principles and supplementary criteria into the framework as "benchmarks" for evaluating the sustainability of proposed new plans or developments.

Sources of definitions and principles of sustainability and sustainable development now number in the hundreds if not thousands (e.g. the CERES Principles, Bellagio Principles, Hanover Principles, Aalborg Charter, The Natural Step, Ecological Footprint, etc.). Local community sustainability plans are also obvious sources of assessment criteria. In the US, however, local sustainability plans are evolving; even where adopted in principle, they are rarely integrated into comprehensive plans as planning actions. *The Policy Guide on Planning for Sustainability*, recently adopted by the American Planning Association and modelled on the four conditions of The Natural Step, shows how a framework of sustainability objectives can systematically generate a comprehensive strategy of specific planning actions.[3]

No one definition of sustainability can meet everyone's needs and expectations. Most US communities in the throes of sustainability planning begin with a variant of the "Brundtland" definition: "Sustainable development is that development that meets the needs of the present without compromising the ability of future generations to meet their needs."[4]

Beyond that definition, common principles are evident in most sustainability planning efforts, although priorities vary widely. Many of the common principles and processes typically used in sustainability planning are listed in **Table 1**. Sustainability principles and criteria are also outlined in the United Nations EIA Handbook[5] and in many other community contexts.

Incorporating sustainability concepts into existing EIA frameworks: the CEQA case study

Existing CEQA sustainability framework

The first step in developing an EIA framework that can incorporate principles of sustainability is to identify where, and to what extent, these principles are already embodied in the existing assessment regulations and implementing procedures. In CEQA, an "EIA framework" and further guidance for addressing environmental impacts in sustainability terms can be found in three locations in the regulatory *Guidelines for Implementation of the California Environmental Quality Act* (the *"Guidelines"*): first, §§15120 to 15132: Contents of Environmental Impact Reports (EIR); second, Appendix F: Energy Conservation; and, third, Appendix G: Environmental Checklist Form.[6]

The first source specifies contents of the EIR. Selected portions contain *implicit* direction for assessing sustainability, such as consideration of unique or rare resources, area-wide plans and the resource base, conservation of energy, long-term risks to human health and safety, irretrievable and irreversible commitment of resources, cumulative impacts, and the needs of future generations. Note, however, that CEQA omits discussion of social and economic effects unless they are related through a chain of cause and effect to physical changes in the environment.

The second source, Appendix F: Energy Conservation, contains an outline for analyzing the potentially significant energy implications of a project in an EIR. Unfortunately, energy analyses are typically applied only to *significant* impacts, although most energy impacts fall below the "significance threshold" and therefore never find their way into the EIA analysis. Most energy *use* - conditioning building space, running appliances, pro-

ducing material for structures and infrastructure, pumping water, maintaining lawns, or operating cars - is not considered a "significant impact" in CEQA analysis. Similarly, energy *production* (on-site measures such as photovoltaic cells or co-generation, or off-site conventional sources) rarely meets the "significance threshold". Materials flows receive even less attention. To turn limitation into opportunity will require new analytical tools, and the political will to address energy issues within the range of "significant impacts." If followed rigorously, however, the outline could produce a comprehensive analysis of energy consumption impacts and conservation (mitigation) measures to make projects more sustainable.

The third source, *Guidelines* Appendix G, is an Environmental Checklist form. When a public agency in California contemplates "approval" of a "project", it first conducts a screening "initial study" (IS) to determine whether a more detailed EIR is required. The IS follows an Environmental Checklist that covers 16 impact categories, each with related subtopics: aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation/traffic, and utilities and service systems. Socio-economics is not included as a category. Each category asks whether the project would have potentially significant impacts on the environment; less than significant impacts *with* mitigation; less than significant impacts; or no impacts whatsoever. The Checklist provides a particularly useful template to adapt to assessment of sustainability because it is comprehensive, i.e. it covers a wide range of possible *types* of impacts.

Table 2

Energy sustainability criteria

- Is the project located so as to minimize automobile traffic to jobs, shopping and services?
- Does the density of development support transit connections with other destinations?
- Do the layout, density and mix of uses support internal transit, pedestrian and bicycle circulation?
- Does the layout of the project conserve embodied energy through compact development patterns?
- Do the structures use energy-efficient space conditioning, lighting and mechanical systems?
- Does the layout of streets and buildings maximize the potential for solar energy?
- Are narrow streets used to reduce embodied energy, provide shading and encourage bicycles?
- Are buildings designed using passive solar energy principles?
- Is at least one of the model homes a super energy-efficient/ passive solar home?
- Is shading used effectively to reduce heating loads?
- Are construction materials produced with energy-efficient processes?
- Does the landscaping require little irrigation, fertilization and maintenance?
- Does the project include electric car recharge outlets and natural gas refuelling station(s)?
- Does the project allow home occupations and live-work units?
- Does the project include a telecommuting centre and state-of-the-art data lines for telecommuting and home offices?
- Are construction practices energy and resource conserving?
- Are construction materials produced from recycled materials and will they be recyclable in the future?
- Are recycling facilities available?
- Are recycled materials used in roads and structures?

Refining CEQA for assessment of sustainability

In view of the considerable evidence that current EIA methods (in conjunction with other environmental statutes, regulations, general plans, etc.) do peripherally address many elements of sustainability, the simplest way to bring sustainability into clearer focus would be to make one brief addition to the CEQA *Guidelines*, Section 15126(a) (Contents of an EIR): "This analysis also shall address the project's environmental impacts in relation to their compatibility with principles of environmental sustainability. A project's failure to comply with these principles shall be considered a significant impact." However, this approach does not provide explicit guidance on implementation and would likely lead to confusion, potential litigation, and likely a superficial level of analysis.

As a practical alternative, the CEQA *Guidelines* Appendix G Environmental Checklist provides a framework that can be augmented by references to specific sustainability principles and adapted to serve the purposes of sustainability assessment. The ability to incorporate sustainability criteria into EIA varies among environmental categories. For example, for some categories (e.g. biodiversity and agriculture) we lack adequate data to detect shifts from sustainable to non-sustainable conditions. In contrast, for regional air quality and, to a lesser extent, water quality, data and standards are generally available. More problematic is how to allocate a local "fair share" of project effects that are transregional, transnational or global in effect, such as off-site emissions of CO_2 and other greenhouse gases. Also problematic is accounting for the productive land areas required to furnish a project's present and future resource demands. Sample criteria developed to integrate energy sustainability into the existing checklist are presented in **Table 2**.

These examples underscore the necessity to identify the contexts within which sustainability is addressed: for example, *local* sustainability is generally defined as the area covered by the general plan; *regional* sustainability is defined by physiographic or political or service regions such as air basins, watersheds, bioregions, viewsheds, water service areas and regional transportation planning areas; and *global* sustainability could include various transnational, inter-hemisphere or other large-scale global areas. (Our "ecological footprint," which no longer coincides with the geographical location and urban limits of human settlements, can serve as a proxy for numerous essential life-support functions and a tool to assess the *relative* impacts of new development on the sustainability of off-site resources.)

On a local level, we can quantify the capacities of local service delivery systems in relation to populations served and identify the threshold levels at which capacities are exceeded. We also can assess potential *site-specific* impacts on long-term (i.e. sustainable) public safety and biodiversity by observing siting and design constraints imposed by the physical hazards and ecological sensitivity of the landscape itself. Indicators of "quality of life" (economic vitality, aesthetics, cultural resources, recreation, etc.) are less amenable to quantification. Two components of quality of life (i.e. traffic and noise) are exceptions; measurable standards and thresholds exist for both and we can assess, if not adequately mitigate, their impacts on the sustainability of quality of life. In all other cases where we lack either data or definition of limits or capacities, the only "measure" of sustainability may be qualitative – a "best effort" or "best practices" approach to compliance with sustainability principles.

To address these issues, we have developed a modified CEQA Checklist that incorporates principals of sustainability and attempts to apply criteria to determining sustainability. This checklist would be applicable to all manner of projects, plans and policies, and would serve at a minimum to focus the EIA preparers and decision-makers on issues of sustainability. This approach has been developed for the full range of environmental topics addressed in the CEQA Checklist (which parallels the biophysical and planning issues typically addressed in EIA worldwide). In the sample page from the Modified CEQA Checklist (**Table 3**), Column 1 presents the Checklist text as modified to incorporate explicit as well as implicit reference to sustainability; Column 2 identifies the appropriate scope, or context, of analysis; and Column 3 provides representative criteria for assessing sustainability and, where appropriate, suggests an "ecological footprint" approach. This sample page addresses biological resources and land use, including sustainability criteria. Similar matrices have been developed for all 16 CEQA Checklist issues, ranging from water quality to air quality, cultural resources and population.

Limitations and opportunities of sustainability impact analysis: discussion and summary

The case above confirms that the EIR, as a vehicle for sustainability analysis under current practice in California, presents both limitations and opportunities. Many generic limitations discussed above can be overcome when an EIR becomes part of a local comprehensive plan (for example, as an SEA or programme EIA). This combination enables a broader analysis and more policy options than would be possible in a project-specific EIA. It also provides an implementation mechanism for sustainability principles in communities that have begun planning in these terms. The EIA by itself can only address sustainability in relation to *pro-*

Table 3
Energy sustainability criteria

Modified CEQA Environmental Checklist: focus on sustainability	Context for assessment	Criteria for sustainability assessment (examples)
Biological resources. Would the proposal:		Statutory listings of endangered and threatened species are found in endangered species act(s) and regulations. Other standards (e.g. for wetlands) are found in federal law and regulations and, to an extent, in state law and regulations. Standards for locally important resources are found in general plan policies. No global standards for loss of biodiversity, and limited protection for species not officially listed:
a) Contribute to the reduction of endangered threatened or rare species or their habitats (including but not limited to plants, fish, insects, animals and birds) such that populations could be reduced to non-sustainable levels?	a) State and nation for status of endangered and threatened species	◆ Any loss of listed rare or endangered species
b) Reduce or eliminate locally designated species or specimens (e.g. rare or sensitive species not listed under state or federal government) or important specimens that represent a local heritage, such as trees?	b) Local and state for designations of importance	◆ Conservation easements to protect areas of native oak woodland, wetland or grassland
c) Reduce, degrade or fragment locally designated natural communities and communities that contribute to regional or state-wide biodiversity (e.g. redwood forest, oak woodland, grassland, coastal habitat, etc.)?	c) Site and adjacent sites for affected resources, corridors, habitat relationships, local populations	◆ Reduction of population of fish, wildlife or plant species below self-sustaining levels
d) Reduce or compromise the long-term sustainability of local and regional wetland habitats (e.g. marsh, riparian and vernal pool)?	d) Regional (bioregion) for status and relationships of important natural communities (e.g. wetlands)	◆ Loss of native trees over 4 inches at breast height, or over 10% tree loss based on individual or canopy basis
e) Interfere with wildlife dispersal or migration corridors?	e) Site and adjacent sites for affected resources, corridors, global for migratory species	◆ Minimum "no net loss" of functions or values of potentially affected wetland resources
		◆ Typical compensatory mitigation of filled wetlands is 2:1, to allow for time lapse in functioning of replacement wetland
		◆ Retention of minimum 100-foot buffer from either bank of affected stream
Land use and planning. Would the proposal:		Objectives, standards and criteria for assessment based primarily on local general plan policies, and policies of agencies with jurisdiction. State as well as local standards may apply to agricultural conversion:
a) Conflict with general plan forecasts, land use designation, policies or zoning?	a) Local general plan, zoning ordinance	◆ Criteria to determine importance and economic viability of agricultural land: parcel size, soil classification, water availability, crop suitability, adjacent land uses, existing and historic land use, agricultural preserve potential, general plan designation
b) Conflict with applicable environmental plans or policies adopted by agencies with jurisdiction over the project?	b) Region varies with jurisdiction	◆ Rate of conversion of agricultural land within defined region to urban uses in acres per year, ratio of converted agricultural land to historic resource, and percent remaining
c) Be compatible with existing land use in the vicinity?	c) Local general plan	◆ "Footprint" of total acres of productive agricultural land required to provide food and fibre for new population on per capita basis (percent local, percent imported, net imported)*
d) Irreversibly eliminate significant agricultural resources (e.g. farmlands of local importance) from sustainable use, or interfere with operations (e.g. impacts to soils or farmlands, or impacts from incompatible uses)?	d) County, region and state, for designation of "importance" of agricultural resources, soils maps, economic value	
e) Disrupt or divide the physical arrangement or an established community (including a low-income or minority community)?	e) Local general plan, neighbourhood plans, economic development plan	
f) Conflict with plans, goals or policies fostering sustainable development?	f) Local sustainability plan, if one exists	

*Not currently used in CEQA analyses, but useful in assessing sustainability.

posed plans or *new development*, not in relation to ongoing community actions; if, however, ongoing actions were guided by a general plan that contained sustainability policies, some indicators of sustainability (public health and welfare) ordinarily not visible on the project-level EIA "radar screen" would become more visible.

EIA is also limited in its ability to evaluate economic, social and environmental trade-offs, even though most social and economic decisions have environmental implications. A holistic EIA approach to addressing sustainability would need to go beyond simply showing a nexus between social or economic impacts and physical consequences and consider the economic and social implications of development on equity and quality of life, as well.

Another practical limitation in using EIA as a vehicle for sustainability analysis is that few standards exist. Where standards that reflect sustainability principles do exist, compliance with the standards is a useful measure of sustainability, readily incorporated into an EIA.

Finally, unlike the typically static EIA, the assessment of impacts on sustainability should be dynamic and adaptive, as is the process of sustainability planning itself. Sustainability is not the end point often associated with a specific project, but rather a process, moving towards more sustainable practices in evolutionary progression and towards the long-term ability to reproduce and renew.

Ultimately, planning for sustainable communities requires not simply semantic "tweaking" of our current planning and EIA tools, but also a major reassessment of the way we conduct ourselves and our communities and acknowledge their relationships to the environment and to other communities, the region, and the global community beyond. Understanding and acceptance of the responsibilities of sustainable development is more likely to occur at a local level, even though consensus as to the nature and causation of such phenomena as climate change (warming) has come from global rather than local evidence. With relatively few changes, the existing CEQA Environmental Checklist framework could be adapted to address issues of sustainability. As in 1970, with the advent of NEPA and CEQA, this would represent only a beginning, to be refined by practitioners and policy-makers over the years. But it would help turn the corner towards addressing these critical issues in a more effective manner in EIA.

Notes

1. 42 U.S.C. § 4321 et seq.
2. Pub. Resources Code, § 21000 et seq.
3. APA (American Planning Association) (2000) *The Policy Guide on Planning for Sustainability*. New York.
4. World Commission on Environment and Development (1987) *Our Common Future*. Oxford University Press, UK.
5. UNEP 1996. *Environmental Assessment Training Resource Manual*
6. California Code of Regulations, Title 14, § 15000 et seq. and Appendices A-K.

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World News

Greening of public events

The 2000 Olympics in Sydney demonstrated a growing trend towards making major public and sporting events more environmentally friendly. The Games in Australia this summer were the first to include a comprehensive environmental plan as part of a city's successful bid to the International Olympic Committee (IOC). The Sydney organizers followed through by making the Athletes' Village the world's largest solar-powered suburb. What had been a degraded area was transformed into Sydney Olympic Park, a sporting, residential, business, recreation and conservation district. Efforts to protect the natural habitat included replanting of native grass and tree species.

In recognition of its efforts to protect the environment during the development of its Olympic facilities, the Sydney Olympic Co-ordination Authority won the Banksia Award's 2000 gold prize. The award cited the protection of two endangered species, the Green and Golden Bell frogs. Organizers worked with herpetologists from the Australian Museum to restore and protect frog habitat, as well as to clean up and restore wetlands and creek areas.

"Green" action also extended to the Games' operation. Spectators took public transport to reach the venues. Many vendors used biodegradable cornstarch-based food service items. Coca-Cola, a major supplier of soft drinks, brought in 100 experimental coolers designed to reduce emissions. It was one of two drinks suppliers to announce that they will switch to refrigerators that do not use greenhouse gas coolants. The company said earlier this year that it would cease using drink refrigerators that require hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs). Coca-Cola also said it will switch to "cost-efficient" coolant alternatives by the next Olympics in Athens in 2004. The Australia-based Foster's Brewing Group began an immediate ban on purchasing refrigeration units that use HCFCs and HFCs, although their refrigerators at the 2000 Games still relied on conventional coolants. These companies' actions responded to a campaign by Greenpeace that helped develop a refrigeration alternative called "Greenfreeze", which uses hydrocarbon gases such as propane in place of HCFCs and HFCs.

In recent years, a comprehensive set of environmental guidelines for the Olympic Games has emerged. The organizers of the 1994 Winter Games in Lillehammer, Norway, made extensive efforts to take the environment into account, using energy-efficient building methods and recycling existing buildings. They also used waste reduction methods and addressed visual pollution problems. Their efforts were recognized by UNEP, which awarded the Global 500 Award to the Lillehammer Olympic Committee.

Following the 1992 Rio Earth Summit, the Olympic Movement prepared its own Agenda 21, which was adopted at the IOC session in Seoul in June 1999. The Olympic Agenda 21 is implemented through collaboration between the Olympic Movement and UNEP. A joint IOC/UNEP Working Group provides policy advice and guidance and monitors implementation.

Future Olympic Games will build on the work of the Olympic Movement and that of UNEP. Salt Lake City, the site of the 2002 Winter Games, has established a 12-point Environmental Platform, while Athens is committed to meet challenges related to air and water quality, fragile natural and cultural areas, traffic and waste management.

Other major events are also beginning to include environmental concerns in their planning and operations. The 2000 version of Oktoberfest in Munich, Germany, for example, adopted strict environmental standards. The 167th annual festival attracted around 6.5 million visitors over 18 days. Fairgoers typically consume enormous amounts of food and drink: this year 600,000 chickens, 300,000 sausages and almost 6 million litres of beer. Organizers required all plates, beer mugs, knives and forks to be re-usable. Continuing a practice begun last year, dishwasher rinse water was recycled to flush the 830 toilets, reducing water consumption by 16%.

For the first time, visiters were offered the choice of organic free-range chickens. One of the event's catering companies, Ammer, switched exclusively to "bio" (organically raised) chickens. Although they are considerably more expensive than regular birds, the company reported sales comparable to previous years, indicating that many people are willing to pay more for organic food. Organic sausages and sauerkraut were also available from caterers.

For the first time caterers, stall holders and ride operators, whose environmental credentials were considered when participants were chosen, were offered renewable energy from the City of Munich. Despite a three pfennig per kWh surcharge, about 20% chose to take advantage of this offer. The proceeds will be reinvested in renewable energy projects. The event required about 2.35m kWh of electricity overall, enough to supply 1000 German homes for a year.

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World Bank environmental report criticizes lack of environmental leadership

The World Bank's annual review of global environmental issues stresses that lack of leadership on environmental issues is hampering sustainability efforts. While there are some examples of environmental progress, problems such as climate change, biodiversity loss and water shortages are still severe despite numerous international agreements and conventions. *Environment Matters*, released at the World Bank/International Monetary Fund joint meeting in Prague in September, covers the Bank's environmental activities from July 1999 to June 2000 and assesses the challenges that lie ahead.

"The most fundamental environmental management constraint the world faces is not lack of resources, but lack of leadership," according to the authors. They note that citizens are still often ahead of politicians in calling for stronger environmental management, citing the pro-environment protests and international trade and finance meetings in Seattle and Washington, D.C.

The report is not entirely gloomy. It cites successful efforts to promote regional and national water resource planning programmes. New programmes reviewed include the Prototype Carbon Fund (PCF), an effort to create a market in project-based emissions reductions under the provisions for Joint Implementation and the Clean Development Mechanism. The PCF will use funds from governments, and from private companies, to invest in cleaner technologies in developing countries aimed at promoting sustainable development and reducing greenhouse gas emissions. Emissions reductions will be independently verified and then transferred back to the Fund's investors in the form of emissions reduction certificates rather than cash.

The PCF, the Critical Ecosystem Partnership Fund, and a 12% increase in GEF grants are listed as signs that "a new working partnership among government, business and civil society is emerging to push for sustainable development." The authors conclude that national and international leadership and support for responsible environmental management are key needs that must be met for further progress.

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Industry Updates

Sustainability-focused companies are more profitable

Companies that pursue sustainable business strategies perform better financially than those that do not, according to two recent studies. The first, an annual review of the Dow Jones Sustainability Group Index (DJSGI), found that companies in the index outperformed those on the regular Dow Jones index by several measures. During the first half of 2000, the average return on equity of DJSGI companies was 14.89%, but it was only 8.43% for all Dow Jones index companies. The average return on investment was 11.09% for DJSGI companies versus 7.3%, and the average return on assets was 5.81% compared to 3.6%. The euro-denominated DJSGI has roughly equalled the DJGI and Morgan Stanley Capital International indices since January 1999. A small under-performance in the first three quarters of 2000 occurred mainly because of the fall of the euro in view of the index's disproportionate weighting in the euro zone, according to DJSGI.

The DJSGI, begun in September 1999 by Dow Jones Indexes and the Zurich-based SAM Sustainability Group, is the first global index of companies that avowedly pursue sustainable strategies. It tracks the financial performance of over 200 companies. Criteria for inclusion in the DJSGI include environmental stewardship, fair treatment of employees, customers, communities and shareowners, and commitment to innovations that reduce pressure on natural and human resources. "Investors are attracted to corporate sustainability because, as a business strategy, it creates long-term shareholder value by embracing opportunities and managing risks associated with economic, environmental and social developments," says David E. Moran, President of Dow Jones Indexes.

The second study was conducted by the Institute for Operations Research and Management Sciences (INFORMS). It concludes that American companies that adopt strict global environmental standards abroad have better stock market performance at home. The study appears in the August 2000 issue of *Management Science*, an INFORMS publication. INFORMS' researchers looked at 89 companies with headquarters in the US and operations abroad. They found that a positive relationship exists between the market value of a company and its environmental standards. After controlling for the influence of physical assets, capital structure, and multinationality, companies with relatively high global environmental standards were each worth approximately US$10 billion more than those adopting less stringent local standards. Almost 60% of companies had their own strict internal standards, while some 10% chose to use developing country standards. The study refutes the idea that global environmental standards are a financial liability that depresses market value. The authors suggest developing countries using lax environmental regulations to attract direct foreign investment may end up with poorer quality, less competitive firms.

For more information, contact: DJSGI/SAM Sustainability group, Zollikerstr. 60, 8702 Zürich, Switzerland, Tel.: +41 1 397 1010, Fax: +41 1 397 1080, E-mail: info@sustainability-index.com, Internet: www.sustainability-index.com; or Barry List, INFORMS, Tel: +1 410 691 7852, Internet: www.informs.org. ◆

California allows low-emission vehicles in carpool lanes

The market for low-emission vehicles (LEVs) received a boost in July when the State of California began to allow them to use highway lanes reserved for carpooling. The State's major cities are notorious for traffic jams and associated air pollution and wasted fuel, especially Los Angeles. In an effort to reduce traffic, many California highways have designated carpool lanes. A new California Air Resources Board rule will permit most electric and alternative fuel vehicles to use these lanes even if the driver is alone at the time.

Drivers can obtain a special sticker from the Board certifying a vehicle as zero-emission, ultra-low emission or super-ultra-low emission (ZEV, ULEV or SULEV). The new rule is intended to reward vehicle owners, both private and corporate, who have made a commitment to use cleaner-burning fuels, says Rick Morrow of the Southern California Gas Company. The company provides compressed natural gas (CNG) to stations in Southern California. Many vehicles currently running on CNG are ULEVs and therefore eligible to use carpool lanes.

California's new rule could benefit not only single drivers of low-emission vehicles, but also taxi, shuttle and messenger service companies that already have eligible fleet vehicles. Access to carpool lanes could give such companies a competitive advantage.

For more information, contact: CARB, 2020 L Street, Sacramento, CA 95814, USA, Tel: +1 916 322 2990, Fax: +1 916 445 5025, Internet: www.arb.ca.gov. ◆

UNEP Focus

UNEP

UNEP assesses regional environmental threats in the Balkans

An international team of experts, assembled by UNEP after the recent conflict in the Balkans region, visited Albania and the Former Yugoslav Republic of Macedonia in September. The purpose of these UNEP Field Missions was to assess environmental damage, including identification of hot spots resulting from environmental problems that predate the conflict. While neither Albania nor Macedonia was a scene of combat, severe environmental strains were caused by the hundreds of thousands of fleeing civilians crowding into refugee camps. The enormous social and economic problems created by the conflict and its aftermath make it even more difficult for their respective governments to deal with the environmental consequences and with pre-existing environmental problems.

The UNEP missions inspected refugee camps, took soil and water samples, and assessed the institutional capacity of the Albanian and Macedonian governments to address environmental problems. They mapped pollution sources and seriously contaminated sites, some of which need urgent attention. The final reports of each mission, due in November, will include an evaluation of the capacity of national, regional and local authorities to adopt and enforce policies to protect and improve the environment. UNEP's work in the region contributes to the Regional Environmental Reconstruction Programme of the Sta-

bility Pact for South-Eastern Europe, whose aim is to promote security, democracy and institution-building in the countries affected by the Balkans crisis.

The two missions followed up on work in 1999 by the joint UNEP/UNCHS Balkans Task Force (BTF), which focused on the conflict's consequences for the environment and human settlements in Kosovo, Montenegro and Serbia. Another follow-up was conducted by the BTF's Desk Assessment Group on Depleted Uranium, a team of scientific experts that reviewed new data supplied to the UN by NATO. The Desk Assessment Group's 21 September meeting resulted in a recommendation that the UN and its partners conduct field studies of sites in Kosovo that had been struck by ammunition containing depleted uranium. Participants included representatives of UNEP, the International Atomic Energy Agency, the UN High Commissioner for Refugees, the UN Department for Disarmament Affairs, the Royal Society of London, the UN Medical Service, the UN Mission in Kosovo, and the Swedish Radiation Protection Institute.

"When we finalized the Balkans Task Force report on the environmental effects of the Balkans conflict last year, the scientific experts advised that there was insufficient data available to comprehensively address the issue of the impacts of depleted uranium ordnance," said UNEP Executive Director Klaus Töpfer. He added that new information would allow UNEP and other UN agencies to plan a scientific field assessment of a representative sample of depleted uranium sites.

Obtaining financial resources is one obstacle to such a mission, which would have to be paid for by participating agencies and donor countries. The Group's experts also noted that the problem of depleted uranium must be viewed in the context of the other environmental issues facing the region.

For more information, contact: Michael Williams, UNEP, Tel: +41 22 9178242, E-mail: michael.williams@unep.ch; Tore Brevik, UNEP Spokesman, Tel: +254 2 623292, E-mail: tore.brevik@unep.org; or the Desk Assessment Group Chairman, Pekka Haavisto, Tel: +41 79 4770877. Or consult www.unep.ch. ◆

UNEP announces winners of its Millennium International Photographic Competition on the Environment

The winners of UNEP's third International Photographic Competition on the Environment, which took place between June 1999 and April 2000, were announced in September. The "Focus on Your World" competition, co-sponsored by Canon Inc., attracted 16,660 entries from 7877 people in 160 countries and states. The judges, a panel of photographers from around the world, awarded gold, silver and bronze prizes in adult and junior divisions, together with four special prizes and 110 honorary mentions.

Hartmut Schwarzbach of Germany received the Gold Prize in the Adult Division of UNEP's photo competition for his portfolio of three photographs of children living in Manila's slums, "Floating Kids at Manila Bay"

Hartmut Schwarzbach of Germany received the Gold Prize in the Adult Division for his portfolio of three photographs of children living in Manila's slums, "Floating Kids at Manila Bay". The photos were praised by the judges for their sensitive portrayal of the Philippine city's urban environmental problems. Mr. Schwarzbach had won the Bronze Prize in a previous competition. Accepting the award, he said that he hoped "people will become more aware of the problematic situation of the living environment in megacities and realize that environment consists of both humankind and nature, together and for each other." He and the other major prize winners accepted their awards in person at a ceremony in New York.

The Gold Prize in the Junior Division was awarded to Miriam Koehler, also of Germany, for her entry, "Artificial Nature". The Canon Special Prize was given to Luis Veiga of Brazil. The UNEP Executive Director's Special Prize was awarded to Au Chin Ki of China. Wang Xun, also of China, won the International Photographic Council Scholarship. The newly introduced Digital Camera Special Prize went to Claudio Bacinello of Canada.

The gold, silver and bronze prize winners in each division received cash awards as well as commemorative certificates and supplementary prizes of Canon products. The gold prize winners in the adult and junior divisions received US$20,000 and US$ 2000, respectively.

The 124 prize-winning photographs can be viewed online at *www.oneworld.net/media/gallery/unep/*. An international touring exhibition began following the awards ceremony. Details concerning dates and locations will be posted on the competition's site, *www.unep-photo.com*.

The competition was supported by the UN Department of Public Information (UN/DPI), the Joint United Nations Information Committee (JUNIC) and the International Photographic Council (IPC), together with Japan Airlines, the National Geographic Society, *Time*, and the Television Trust for the Environment.

For more information, contact: Jim Sniffen, UNEP Information Officer, New York, Tel: +1 212 963 8094/8210, Fax: +1 212 963 7341, E-mail: info@nyo.unep.org; Tore Brevik, UNEP Spokesman, Nairobi, Tel: +254 2 62 3292, Fax: +254 2 62 3692, E-mail: cpiinfo@unep.org; or Steve Jackson, UNEP Audio Visual Officer, Nairobi, Tel: +254 2 62 3332, Fax: +254 2 62 3927, E-mail: photocomp@unep.org. ◆

UNEP biodiversity information and assessment centre opens in UK

The World Conservation Monitoring Centre (WCMC) in Cambridge, which has become part of UNEP, will act as its global biodiversity information and assessment centre. Besides collecting and disseminating information on biodiversity, the Centre will assist countries in creating their own biodiversity information systems, enabling them to develop science-based environmental policy and regulations. Its mission complements UNEP's key function within the UN system, that of providing information on, and assessment of, all aspects of the natural environment.

As UNEP-WCMC Director Mark Collins points out, "WCMC provides information about the living world, on which we all depend for the basics of life. The Centre provides the objective environmental data that governments, businesses and other organizations require to make strategic decisions. It also monitors changes in the natural

environment to provide early warning of potential crisis." Collins also says that "becoming part of the United Nations is important to us because it gives international recognition of our work. It will enable us to operate at higher levels, making our data more accessible to policy makers and organizations involved in environmental planning. In addition, it gives us better access to the data that has been compiled in countries by their governments. We hope to include this detailed work into our information systems and make it globally available."

WCMC was founded in 1988 and has been supported by the World Conservation Union, the World Wide Fund for Nature and UNEP. The Centre will retain its close links with the non-governmental community, while building partnerships with the private sector and governments. In particular, WCMC's transition to UNEP has received political and financial support from the UK Government.

UNEP Executive Director Klaus Töpfer, in Cambridge for the opening ceremony on 3 July, emphasized that widespread loss of biodiversity is becoming a critical worldwide problem. "Overall," he said, "ecosystems and species populations have declined by 30% in the past 30 years and the trend is continuing." He attributes this loss to the impact of poverty in developing countries, and of unsustainable consumption levels in industrialized countries.

Other speakers at the opening ceremony cited the economic importance of biodiversity and WCMC's role in providing information on environmental threats and their business and economic implications. Lord Holme, co-chair of the corporate social responsibility working party of the World Business Council for Sustainable Development, stressed that the international business community increasingly recognizes the importance of corporate social responsibility, including a commitment to sustainable economic development. Holme also underlined the importance of environmental data in making strategic business decisions. WCMC has worked with the private sector, providing biodiversity information such as presence of threatened species and location of protected areas. These data have been used by companies to help them decide whether to proceed with business ventures in such areas.

UNEP-WCMC has the world's third most-visited environmental web site, with some 2 million hits monthly (*www.unep-wcmc.org*). Visitors include children and other interested members of the public. The site is filled with factual information that can be used for projects and research. Some 200,000 committed professionals rely on UNEP-WCMC data every month.

For more information, contact: Laura Battlebury, Head of Enquiries and Information, UNEP-WCMC, Tel: +44 1223 277314, Fax: +44 1223 277136, E-mail: info@unep-wcmc.org, Internet: www.unep-wcmc.org. ◆

UNEP Division of Technology, Industry and Economics HIGHLIGHTS

UNEP Chemicals to study persistent toxic substances

UNEP Chemicals has begun a two-year, US$5 million programme to study persistent toxic substances and the measures needed to deal with them. Such substances, which pose a serious threat to humans and the environment, are slow to break down chemically under ambient conditions. They can therefore remain in the environment for a long time and be transported long distances. They can accumulate in organisms through the food chain, not only potentially harming those organisms but also reaching the human food supply at levels that create health concerns.

Twelve of these substances, referred to as "persistent organic pollutants" (POPs), are the subject of ongoing negotiations concerning a global treaty. These toxic chemicals were targeted for action by a UNEP Governing Council mandate in 1997. UNEP Chemicals' assessment will complement the work being done in conjunction with treaty negotiations by considering problems associated with the broader category of persistent toxic substances.

There is growing awareness that substances similar to the 12 listed POPs may harm the environment and ultimately endanger human health. Experts are also beginning to recognize that their effects are likely to vary due to different use patterns and environmental factors affecting their deposition and distribution in the environment. However, until now information on the use and effects of these substances in different regions has been scarce. The UNEP assessment is aimed at filling the information gap. It will be based on an analysis of conditions in each region, using information from a variety of sources but applying common methods and approaches.

The two-year study, which began in September, is intended to guide the priorities of the Global Environment Facility (GEF), which is jointly implemented through UNEP, the UN Development Programme (UNDP) and the World Bank. It will be the first full-scale GEF project to focus on this class of chemicals. The results are intended to support international action to protect human health and the environment from persistent toxic substances.

Paul Whylie, former Registrar of the Pesticides Control Authority of Jamaica, is the project manager. His POPs-related experience includes participation in negotiations leading to the Rotterdam Convention and in ongoing talks on a POPs treaty.

For more information, contact: James B. Willis, Director, UNEP Chemicals, Tel: +41 22 917 81 83, Fax: +41 22 797 34 60, E-mail: chemicals@unep.ch; or Linda Durkee, Policy and Communications Advisor, UNEP Chemicals, Tel: +41 22 917 85 11, E-mail: ldurkee@unep.ch. ◆

UNEP analyzes developing countries' Montreal Protocol compliance trends

UNEP DTIE's OzonAction Programme in Paris has released an updated version of its *Analysis of Trends in Consumption and Production of Ozone Depleting Substances in Developing Countries*. This analysis indicates where developing countries stand in relation to their commitments, under the Montreal Protocol, to control ozone-depleting substances (ODS). It helps track, monitor and assess the status of specific developing countries or groups of countries with regard to the 1999 "freeze" target, the first control measure applicable to developing countries under the Protocol.

UNEP uses the Trends Analysis in discussions with National Ozone Units, especially during meetings of the Regional Networks of ODS Officers, to identify the type of aid required in order to meet the freeze and focus attention on possible corrective measures. Analysis, discussions and meetings are part of the information exchange services UNEP provides to developing countries to help them meet their obligations under the Montreal Protocol. Available data currently allow UNEP to assess the status of 105 countries; this represents 81% of all Article 5 (developing) countries, of which there were 130 as of 31 July 2000.

UNEP DTIE on the web: sustainable consumption

UNEP's Sustainable Consumption newsletter is available on the Internet at *members.tripod.com/SC-Network* (see Web Site Highlights, p. 73). Recent issues of the newsletter feature articles on:

- Translating sustainable consumption from a concept to household action. Several studies on sustainable household consumption were presented at a recent three-day workshop in the Netherlands. The studies focused on analyzing aspects of household consumption such as consumption patterns, the determining factors for household consumption, ways to reduce consumption, and how to facilitate change.
- Relationships between consumption and the environment among Mexican youth. These are made more complex by unequal income distribution and cultural diversity.
- Achieving environmental sustainability at Antarctic research stations. The environment of Antarctica, one of the last places on the Earth with a nearly pristine ecological system, is increasingly at risk.

The Sustainable Consumption newsletter, like all UNEP DTIE publications, is also available in hard copy from DTIE's Paris office.

The Trends Analysis web page (*www.uneptie.org/ozat/nou/datareport.html*) shows consumption patterns and likely future reduction trends by graphically presenting trends in countries' ODS consumption and production levels. These show that at least two-thirds of countries covered by the analysis are in a good position to meet their compliance obligations. Some countries, however, will need further focused assistance to meet their commitments.

Klaus Topper, UNEP's Executive Director, has pointed out that "the grace period given to developing countries for the implementation of the Montreal Protocol is now over and the compliance regime [has now begun]. The trend of compliance is favourable, but we should not be complacent. Stakes are very high, and together we have to ensure the continued success of the Montreal Protocol."

The methodology used could be applicable to compliance evaluation of other multilateral environment agreements, such as the Kyoto Protocol, and foster cross-cutting activities with the Montreal Protocol. The Trend Analysis will be maintained and updated on a regular basis (in June and September of each year) by the OzonAction Programme. It will be expanded to include other controlled substances and phase-out targets.

For more information, contact: Rajendra Shende, UNEP DTIE Energy and OzonAction Unit, Tour Mirabeau, 39-43 quai André-Citroën, Paris 75739 Cedex 15, France. Tel: +33 1 44 37 14 50, Fax: +33 1 44 37 14 74, E-mail: ozonaction@unep.fr, Internet: www.uneptie.org/ozonaction.html. ◆

The
Efficient Entrepreneur
A calendar for small and medium-sized enterprises
what cleaner production can do for you
a month-by-month guide to increasing profits and improving the environment

Efficient Entrepreneur Calendar

UNEP DTIE and the Eco-Efficiency and Sustainable Enterprise team at the Wuppertal Institute in Germany have jointly developed *the Efficient Entrepreneur* Calendar for small and medium-sized enterprises (SMEs). In combination with a guidebook, it leads businesses through a programme that helps them find out how much energy, water and raw material they consume, how much pollution (e.g. air and water emissions, waste and noise) they produce, and where costs can be reduced and customer and employee satisfaction be improved.

The Calendar charts a month-by-month programme that concludes with an Efficient Entrepreneur report. It is intended for any firm that considers itself to be an SME, and can also be used by any company that requires an introduction to performance measurement and communication, such as preparation of the ISO 14001 or EMAS implementation.

Copies can be obtained from the Efficient Entrepreneur Online at *www.efficient-entrepreneur.net/* or from the UNEP online bookshop at *www.earthprint.com*. Available in English, French or Spanish. ◆

Books & Reports

GENERAL

Technical Workbook on Environmental Management Tools for Decision Analysis

In early 1999, UNEP's International Environmental Technology Centre (IETC) conducted a training programme on environmental management for representatives of six least-developed countries. Environmental management fundamentals and sustainable development challenges and applications were presented. A significant part of the programme focused on environmental management tools and approaches, such as environmental technology assessment, environmental risk assessment, rapid urban environmental assessment, environmental profiling and environmental management systems. These can help meet the need to integrate environmental considerations into decisions that affect development, whether at national, industry or community level – a need highlighted by many participants. This workbook includes technical papers and three accompanying training modules on the topics covered. The training programme was co-sponsored by the Technical Cooperation Council of Philippines.

(2000). UNEP IETC, Osaka Office: 2-110 Ryokuchi Koen, Tsurumi-ku, Osaka 538-0036, Japan. Tel: +81 6 6915 4581, Fax: +81 6 6915 0304; Shiga Office: 1091 Oroshimo-cho, Kusatsu City, Shiga 525-0001, Japan. Tel: +81 77 568 4582, Fax: +81 77 568 4587, E-mail: ietc@unep.or.jp, Internet: www.unep.or.jp. Pbk., 238p. ISBN 92-807-1814-2.

Protecting Public Health and the Environment: Implementing the Precautionary Principle

According to the precautionary principle, when an activity could potentially harm human health or the environment precautionary measures should be taken even if some cause and effect relationships have not been fully established scientifically. Furthermore, the proponent of the activity, rather than the public, should bear the burden of proof. The precautionary principle has gained recognition in Europe, and been acknowledged in international treaties, but until the mid 1990s it was relatively little known in the United States. At the 1998 Wingspread Conference on Implementing the Precautionary Principle, held in Racine, Wisconsin, scientists, environmental

activists, government researchers and labour representatives discussed ways to formalize and disseminate the precautionary principle. This collection of papers grew out of the Wingspread Conference. It covers definitions as well as theoretical, legal and policy aspects. Several papers are concerned with practical means of integrating the precautionary principle into public policy and corporate operations. Also included are case studies on application of – or failure to apply – the precautionary principle to chemical and petroleum production, agriculture, and land conservation.

C. Raffensperger and J. Tickner, eds. (1999). Island Press, 1718 Connecticut Avenue, NW, Suite 300, Washington, D.C. 20009, USA. Tel: +1 202 232 7933, Fax: +1 202 234 1328, E-mail: info@islandpress.org, Internet: www.islandpress.com. Pbk., 385p. ISBN 1-55963-688-2.

Dictionary of Environmental Science and Technology

What is the ozone shield? How is it related to the oxygen cycle? Environmental science is an interdisciplinary field whose terms and knowledge are derived from ecology, biology, chemistry, biochemistry, meteorology, economics, engineering, politics and sociology. As the environmental field grows, its terminology is becoming more complex and specialized. This dictionary, now in its third edition, provides definitions and cross-references for over 4000 entries. Illustrations and case studies are included for many terms and concepts. While a few entries are specific to the UK legal system, most are in more general use. Also included are some EU and American terms and definitions.

A. Porteous (2000). John Wiley & Sons, Baffins Lane, Chichester, West Sussex PO19 1UD, UK. Tel: +44 1243 779 777, Fax: +44 1243 775 878, E-mail: cs-books@wiley.co.uk, Internet: www.wiley.com. Pbk., 707p. ISBN 0-471-63470-0.

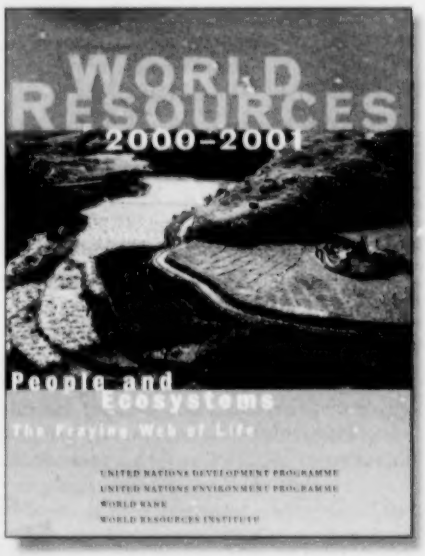
Willingly and Knowingly: The Roles of Knowledge about Nature and the Environment in Policy Processes

Environmental knowledge can be used or abused when decisions are made concerning development, regulatory control, and other areas in which public policy affects the natural environment. In this publication from the Dutch Advisory Council for Research on Nature and the Environment, four case studies are used to analyze the role of environmental knowledge in public policy-making. The authors argue that such knowledge is often defined and developed within the framework of a particular problem, a viewpoint that limits the types of research and information brought to bear on it. They examine the ways problems are perceived and defined, the influence of norms and values on knowledge, characteristics of decision-making processes, and the nature and significance of environmental knowledge. They conclude that it is important to distinguish between the production and uses of knowledge, but also to recognize that values have an unavoidable influence on knowledge.

R.J. In 't Veld, ed. (2000). Lemma Publishers, PO Box 3320, 3502 GH Utrecht, The Netherlands. Tel: +31 30 254 56 52, Fax: +31 30 251 24 96, E-mail: infodesk@lemma.nl, Internet: www.lemma.nl. Pbk., 159p. ISBN 90-5189-868-1.

World Resources 2000-2001

Subtitled "People and Ecosystems, the Fraying Web of Life," the latest in the World Resources Institute's series on the state of world resources examines ecosystems and the impacts humans have on them. *World Resources 2000-2001* focuses on five critical ecosystems (croplands, forests, coastal zones, freshwater systems, grasslands) that have been affected by the interaction of physical environment, biological conditions and human intervention. While they all produce a wide variety of goods and services that sustain human life, some have not been adequately recognized or valued. In addition to its major focus, the book presents an overview of current global environmental trends. It includes extensive data tables on environmental, energy, social and economic indicators. This publication was prepared in collaboration with UNDP, UNEP and the World Bank.



(2000). World Resources Institute (WRI), 1709 New York Avenue NW, Washington, D.C. 20006, USA. Tel: +1 202 638 6300, Fax: +1 202 638 0036, Internet: www.wri.org. Pbk., 389p. ISBN 1-56973-443-7.

OECD Environmental Data/ Données OCDE sur l'environnement: Compendium 1999

Environmental information gathering and reporting by OECD governments is intended to respond to the public demand for information, and to assist in the development, implementation and harmonization of environmental policies. In keeping with these goals, the OECD prepares an annual compendium of environmental data provided by member countries, including information on the state of the environment and major sectoral trends. It is published in a bilingual edition (English and French).

(2000). OECD Publications, 2, rue André-Pascal, 75775 Paris Cedex 16, France. Tel: +33 1 45 24 82 00, Fax: +33 1 49 10 42 76, Internet: www.oecd.org/bookshop. Pbk., 328p. ISBN 92-64-05879-6.

Voluntary Approaches for Environmental Policy

While use of voluntary approaches to environmental control continues to spread in OECD countries, they have not been systematically analyzed until recently. This book examines different types of voluntary approaches, their economic characteristics, and their role and effectiveness in improving corporate environmental performance. It covers public voluntary programmes devised by government agencies; negotiated agreements reached through bargaining between government and industry; and unilateral commitments established by companies or industry groups without government participation. In examining environmental effectiveness, it concludes that neither public voluntary programmes nor negotiated agreements have had more than modest success so far, even if this is for different reasons. Assessment of unilateral agreements was difficult due to lack of independent empirical evaluation, a problem pertaining to all types of voluntary agreements. This OECD report recommends more research on the "soft" effects of voluntary agreements, such as learning and awareness-raising, as well as improved evaluation of their administrative and environmental effectiveness.

(2000). OECD Publications (see above). Pbk., 143p. ISBN 92-64-17131-2.

International Network for Environmental Compliance and Enforcement: Index of Conference Proceedings

This volume provides an index to the papers previously published in the proceedings of five conferences sponsored by the International Network for Environmental Compliance and Enforcement (INECE) between 1990 and 1998. INECE is an informal international partnership of public officials, NGOs and international organizations involved in environmental law and regulatory enforcement. The papers given at its conferences cover a wide range of topics, including both deterrent and incentive strategies to increase compliance with domestic and international environmental laws. The index and the documents listed in it are available on the INECE web site (*www.inece.org*).

J. Gerardu and C. Wasserman, eds. (2000). INECE. Available from Cheryl Wasserman, US EPA Office of Enforcement and Compliance Assurance, 1200 Pennsylvania Ave, MC 2251A, Washington, D.C. 20460, USA. Tel: +1 202 564 7129, Fax: +1 202 564 0070, E-mail: wasserman.cheryl@epa.gov. Pbk., 249p.

CLIMATE CHANGE/ AIR POLLUTION

The Kyoto Protocol: International Climate Policy for the 21st Century

The Kyoto Protocol, adopted in 1997, seeks to control emissions that may lead to global climate change. Agreement on the Protocol required lengthy and difficult negotiations and a number of compromises. Actions to be taken to implement the Protocol remain the subject of international controversy. The authors, who have been involved in the Protocol negotiations, provide a first-hand account of the debate leading to its adoption. They analyze the history and content of the Protocol itself, as well as the economic, political and legal implications of implementation. There are chapters on the major provisions, including emissions reduction commitments, joint implementation by developed and developing countries, the Clean Development Mechanism and emissions trading. Also discussed are "unfinished business" not addressed in the Protocol, and the possibility of creating a Leadership Initiative to reinvigorate adoption and enforcement efforts.

S. Oberthür and H.E. Ott (1999). Springer-Verlag Heidelberg, Tiergartenstrasse 17, D-69121 Heidelberg, Germany. Tel: +49 6221 487 0, E-mail: service@springer.de, Internet: www.springer.de, Hbk., 359p. ISBN 3-540-66470-X.

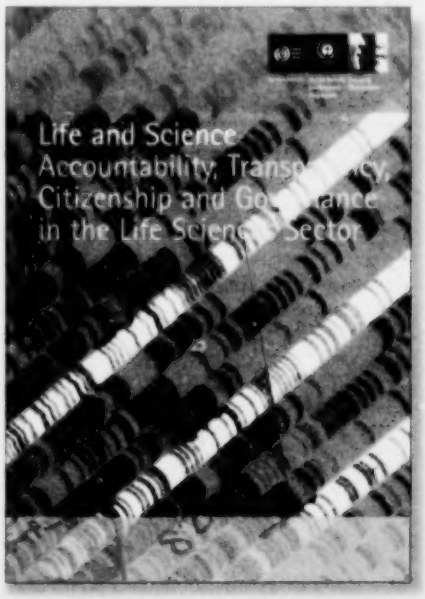
INDUSTRY SECTORS

Life and Science: Accountability, Transparency, Citizenship and Governance in the Life Sciences Sector

Chemical companies have historically made the most of their products using non-living manufacturing systems. Owing to biotechnology and such controversial applications as genetically modified organisms, however, they now increasingly use living systems. As the industry moves from chemistry to biology, the number and complexity of the stakeholder issues it faces is growing. According to this study, most life sciences companies have failed to acknowledge those issues of greatest concern to the public. At the heart of the problem is the fact that companies which are still essentially chemical producers are moving into consumer-driven food markets, but usually without the consumer-oriented focus and communications practices necessary to earn the trust and respect of outside stakeholders.

Life and Science, produced jointly by UNEP and the UK consultancy SustainAbility, explores the environmental and ethical issues of the life sciences industry, including commercial biotechnology. The authors, who reviewed publicly available information from 21 leading biotechnology companies, assessed these companies in three major areas comprising 12 key issues: corporate governance (corporate values, bioethics, research and development); biotechnology risks and benefits (risk assessment, biosafety, endocrine disruption effects, eco-efficiency); and stakeholder concerns (social impacts, biodiversity and bioprospecting, relationship to governments and regulators, animal welfare and labelling).

The report includes an analysis of each key issue, major stakeholder perspectives, and assessment of corporate reporting and communication. It concludes that while the industry's level of corporate communication and transparency concerning traditional health, safety and environment issues is relatively high, there has been an overall failure to deal with emerging issues in any systematic way. It presents recommendations for corporate actions to improve environmental reporting and dialogue and concludes with a discussion of the sustainability of life sciences.



(2000). SustainAbility Ltd., 11-13 Knightsbridge, London SW1X 7LY, UK. Tel: +44 20 7245 1116, Fax: +44 20 7245 1117, Internet: www.sustainability.co.uk. Pbk., 107p. ISBN 1-903168-00-7.

ISWA Working Group on Sanitary Landfill Operations Guidelines

The International Solid Waste Association has produced a set of practical guidelines for landfill operators, intended to address all aspects of the day-to-day operation of sanitary landfills. It provides descriptive recommendations for access, control of litter and health hazards, compaction, control of leachate and other emissions, and site safety, among other topics. The ISWA guidelines are published in a loose-leaf binder. Additional chapters planned for publication can therefore be added as they become available.

(2000). ISWA, Overgaden Oven Vandet 48 F, DK-1415 Copenhagen K, Denmark. Tel: +45 32961588, Fax: +45 32961584, E-mail: iswa@inet.uni2.dk, Internet: www.iswa.org. Hbk., 96p.

CHEMICALS, POLLUTION AND ACCIDENTS

IPCS Environmental Health Criteria

The International Programme on Chemical Safety (IPCS) is a joint venture between UNEP, the International Labour Organisation (ILO) and the World Health Organization (WHO). The IPCS Environmental Health Criteria series provides critical reviews of potential health and environmental effects of chemicals and combinations of chemicals. They are primarily risk evaluations, and are based on published and unpublished studies. These documents are in English, with summaries in French and Spanish. The series is available from WHO and from WHO sales agents. Two new titles are available:

EHC 214: Disinfectants and Disinfectant By-products *(2000). Pbk., 499p. ISBN 92-4-157216-7.*
EHC 216: Human Exposure Assessment *(2000). Pbk., 375p. ISBN 92-4-157214-0.*

WHO, Distribution and Sales, CH-1211 Geneva 27, Switzerland. Tel: +41 (22) 791 2476, Fax: +41 (22) 791 4857, E-mail: bookorders@who.ch, Internet: www.who.int.

WATER

World Water Forum: From Vision to Action

This videotape presents a summary of activities at the second World Water Forum and Ministerial Conference held in The Hague in March 2000, which was sponsored by the World Water Council. Almost 6000 water specialists, politicians, NGO representatives and concerned citizens were brought together in an attempt to define a new worldwide agenda for water in the next century. Many of the discussions focused on public/private partnerships. Others were devoted to water and conflict (notably in the Middle East) and to regional, legal, technical, socio-economic and tourism issues. The Ministerial Conference emphasized approaches to the key challenges of the growing world water crisis.

The videotape is available in SECAM, PAL and NTSC formats. Other documentation includes a report on the Forum sessions, a final report mainly on the results of the Ministerial Conference, and a CD-ROM containing all reports from the Forum and Ministerial Conference. All material produced before, during and after the Forum is available on *www.worldwaterforum.net*.

(2000). Project Secretariat, Second World Water Forum, Ministry of Foreign Affairs, DMI/PS, PO Box 20061, 2500 EB The Hague, The Netherlands. Tel: +31 348 5402, Fax: +31 348 6792, E-mail: secretariat@worldwaterforum.org, Internet: www.worldwaterforum.org.

NATIONAL/REGIONAL

The Mediterranean Action Plan

The Mediterranean Action Plan (MAP) is a UNEP project coordinating the efforts of 20 countries around the Mediterranean Sea, as well as the European Union. Its goal is to reverse environmental degradation of the sea, coastline and inland areas, and to incorporate sustainable

resource management into the region's development policies. Recognizing that no country can control transboundary pollution alone, participating countries have developed an action plan that includes both corrective and preventive approaches to environmental protection. A major aim is to bring environmental considerations into early stages of the development process, when potentially damaging development projects can be modified or stopped. Specific activities in which MAP is involved include coastal zone management, pollution assessment, pollution control and prevention, and protection of ecosystems to maintain biodiversity.

This brochure describes the environmental problems facing Mediterranean countries, as well as MAP's responses to date and ongoing priorities. After describing the evolution of MAP from its adoption in 1975 to the present, the brochure focuses on four major challenges: controlling pollution, protecting the region's natural and cultural heritage, managing coastal zones sustainably, and integrating environment and development. Included is a summary of the roles of (and contact information for) various international bodies active in the region.

(2000). UNEP/MEDU, 48, Vassileos Konstantinou Avenue, 11635 Athens, Greece. Tel: +30 1 72 73 100, Fax: +30 1 72 53 196, E-mail: unepmedu@unepmap.gr, Internet: www.unepmap.org. Pbk., 36p.

The Application of Environmental Management Systems in the European Waste Industry

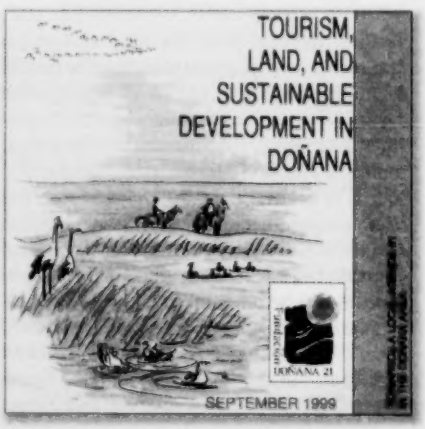
This report, compiled by five European waste management industry associations, examines the use of environmental management systems (EMS) in the European waste industry. Based on results from questionnaires, working groups and national seminars, it looks at the benefits EMS can provide as well as difficulties in implementation. Various EMS schemes and certifications available in European companies are described. The authors point out that the degree of environmental protection offered by adhering to an EMS programme can only be as good as the goals it has set. They encourage choosing ambitious EMS targets to obtain the greatest environmental benefits.

(2000). The Institute of Wastes Management, 9 Saxon Court, St. Peter's Garden, Northampton NN1 1SX, UK. Tel: +44 1604 620426, Fax: +44 1604 621339, E-mail: technical@iwm.co.uk, Internet: www.iwm.co.uk. Pbk., 47p.

Tourism, Land, and Sustainable Development in Doñana

Spain's Doñana region, located in the southwestern part of the country, includes some of the best preserved wetlands in Europe. Land, mostly unpopulated, was created by the silting-up of the old estuary of the Guadalquivir river, producing a complex hydraulic system with a rich variety of ecosystems. The area received international attention in 1998, when a huge release of contaminated water from a nearby mine spilled into the Guadalquivir, threatening wildlife and presenting the risk of long-term damage to local ecosystems. Beyond responding to that disaster, local officials are carrying out long-term planning with regard to conservation and sustainable use, especially for tourism.

This CD gives an overview of tourism and land management development policies for a 3000 km^3 area of the Doñana region considered to have tourism potential. It focuses on preserving natural and cultural resources, while fostering socio-economic development for residents. The load capacity of the land, and requirements that need to be met for developing an integrated tourism



project, such as public and local business participation, are discussed. *Tourism, Land, and Sustainable Development in Doñana* sets out 50 ideas concerning project development in the region, including an initial set of programmes and actions to be undertaken. It can be read with Microsoft PowerPoint or Internet Explorer.

(1999). AUIA, c/ Papa Negro, 41.B, Parque Conde de Orgaz, 28043 Madrid, Spain. Tel: +34 91 388 3398, Fax: +34 91 759 7861, E-mail: auia@ran.es. CD-ROM.

Green Productivity Programs and Activities in the Asia-Pacific Region

Green Productivity is a strategy for improving both productivity and environmental performance, in order to promote overall socio-economic development. Its proponents consider that Green Productivity is applicable not only to manufacturing sectors but also to agriculture and service operations. The Asian Productivity Organization (APO) promotes Green Productivity through working with national productivity organizations of member and other Asian countries. Its Green Productivity programme places particular emphasis on small and medium-sized enterprises, which account for over 90% of all businesses in Asia and employ over half the workforce. This collection of case studies on Green Productivity projects in the region is the product of a March 1999 workshop sponsored by APO. Project sites included farms, dye works, electroplating shops, food processing plants, a tannery, machine shops, textile mills and an "eco-community." The book also includes country reports on programmes in each of the 12 participating countries.

(2000). Asian Productivity Organization (APO), Hirakawa-cho Dai-ichi Seimei Building 2F, 1-2-10, Hirakawa-cho, Chiyoda-ku, Tokyo 102-0093, Japan. Tel: +81 3 5226 3920, Fax: +81 3 5226 3950, E-mail: apo@gol.com, Internet: www.apo-tokyo.com. Pbk., 138p. ISBN 92-833-2258-4.

EDITIONS FRANCAISES

Vers l'application renforcée du droit international de l'environnement

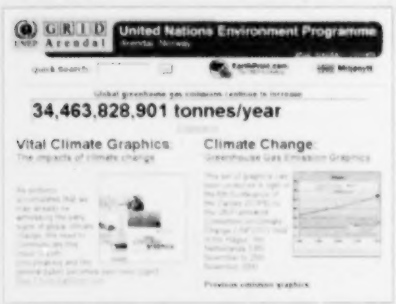
La caractéristique essentielle du droit international de l'environnement aujourd'hui est la multiplication des textes contraignants, la dispersion des organes créés pour leur mise en œuvre et les difficultés d'application dans un grand nombre d'Etats. Il apparaît donc nécessaire, à travers une comparaison des mécanismes existants, de préparer des voies d'harmonisation et de simplification des procédures permettant de vérifier si les obligations conventionnelles sont respectées par les Etats parties.

L'ouvrage, à travers les interventions et débats qui ont eu lieu lors de la conférence internationale organisée par le Ministère de l'environnement français sur le sujet en 1996, examine tout d'abord

Web Site Highlights

GRID Arendal Climate Change
www.grida.no/climate/

As evidence accumulates that we are witnessing the early signs of global climate change, the importance of how this issue is presented to both policy-makers and the general public is becoming ever more urgent. UNEP's Global Resource Information Database web site has striking graphics and a running "carbon



counter" that illustrate greenhouse gas emissions and the impacts of climate change.

For more information, contact: UNEP/GRID-Arendal, Longum Park, Service Box 706, N-4808 Arendal, Norway. Tel: +47 3703 5650, Fax: +47 3703 5050, E-mail: grid@grida.no.

Plastics in ELV
www.plastics-in-ELV.org

During the last two decades, the amount of plastics in new vehicles has increased in response to demands for safety, comfort and lighter weight. The growing use of plastics and composite materials has reduced the average recyclable portion of vehicles and created more shredder residue requiring disposal. The purpose of this joint project of European vehicle and plastics manufacturers is to encourage compliance with the tough targets for vehicle component recycling set out in the European Union's end-of-life-vehicles (ELV) directive. The site offers help to industry members in developing synergies, establishing interactions and learning from best practices that will enable them to meet their targets, as well as serving as an information bank. There are sections covering the three key processes (dismantling, material recycling, and shredder residue treatment) and analyses of the latest technologies and environmental costs.

For more information, contact: Nelo Emerencia, APME, Tel: +32 2 672 8259

Sustainable-Consumption.net (SC.net)
members.tripod.com/SC-Network

Every three weeks UNEP Sustainable Consumption Programme publishes a free internet-based newsletter called SC.net, available on the UNEP Sustainable Consumption site. This site hosts a network of organizations and individuals working on sustainable consumption – including indicators, market research, youth, lifestyles, advertising and communication, and business tools such as life cycle assessment, eco-design and sustainable services. There is a special focus on developing countries. SC.net serves as a South-North forum, as recommended by a 1998 international conference on sustainable consumption held in Kabelvag, Norway.

Requests to subscribe can be sent to unep.tie@unep.fr. For more information, contact: Anne Solgaard, UNEP DTIE, Paris (anne.solgaard@unep.fr).

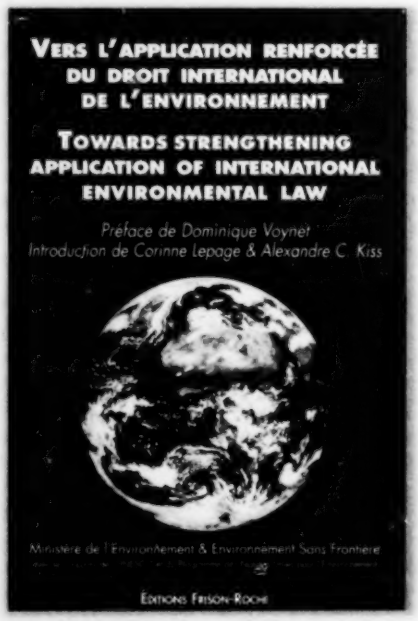
les fonctions de contrôle des conventions relatives à l'environnement. Les parties suivantes traitent des difficultés de mise en œuvre de ces conventions et des moyens de contrôle possibles, notamment le système des rapports, ainsi que du rôle des organisations internationales dans l'application du droit international de l'environnement. Sont ensuite rapportées les recommandations proposées par les organisations non gouvernementales à l'issue de la conférence.

(1999). Editions Frison-Roche, 18 rue Dauphine, 75006 Paris, France, 193 p. ISBN 2-87671-313-6

Désinfecter les sols autrement...

L'interdiction prochaine du bromure de méthyle, la nécessité de s'adapter aux mesures agri-environnementales et les demandes de l'aval de la filière Fruits et légumes nécessitent de revoir les méthodes de désinfection des sols. Les moyens développés par la recherche pour mieux connaître le potentiel infectieux des sols et sa nuisabilité, les expérimentations et les observations réalisées par le développement permettent maintenant de poser des diagnostics et de proposer des solutions plus adaptées. Ce manuel présente des méthodes et des solutions pour certaines cultures légumières et en arboriculture fruitière. Des exemples de calcul des coûts de la désinfection sont fournis ainsi que des choix de stratégies.

(1999). Editions Centre technique interprofessionnel des fruits et légumes, 22 rue Bénangère, 75009 Paris, France. Tél. : +33 1 47 70 16 93. Fax : +33 1 42 46 21 13. Internet : www.ctifl.fr. 103 p. ISBN 2-87911-134-X.


VERS L'APPLICATION RENFORCÉE DU DROIT INTERNATIONAL DE L'ENVIRONNEMENT
TOWARDS STRENGTHENING APPLICATION OF INTERNATIONAL ENVIRONMENTAL LAW
Préface de Dominique Voynet
Introduction de Corinne Lepage & Alexandre C. Kiss
Ministère de l'Environnement & Environnement Sans Frontière
Editions Frison-Roche

Azote, Cultures légumières et fraisier, Environnement et Qualité

Ce manuel présente les problèmes posés par l'utilisation mal contrôlée des intrants azotés. Le premier chapitre montre comment l'azote, sous ses différentes formes, est cependant nécessaire et irremplaçable pour la croissance des plantes et comment il est assimilé, transporté et métabolisé par ces dernières. Le second chapitre procure des informations sur le cycle de l'azote et le bilan prévisionnel de la fertilisation azotée. Il présente également les outils de diagnostic et d'aide à la décision. Suivent une série de fiches techniques et pratiques établies pour 18 espèces qui permettent de piloter la fertilisation des principales plantes légumières cultivées en France, en tenant compte des objectifs de production.

(1999). Editions Centre technique interprofessionnel des fruits et légumes, 223 p. ISBN 2-87911-108-0.

Outils de pilotage – Bonnes pratiques en arboriculture fruitière

Adopter un itinéraire technique de production raisonnée ou intégrée consiste à évaluer de manière cohérente les besoins réels des plantes par des observations, des mesures adaptées, afin de limiter les antagonismes, pertes et nuisances pour l'environnement. Ce manuel présente un ensemble de démarches compatibles pour mieux gérer les facteurs de production. Chaque facteur de production intervenant dans l'itinéraire technique fait l'objet d'un chapitre. Chacun d'eux décline dans l'ordre les objectifs, les principes et la démarche à suivre et présente un récapitulatif des outils et moyens qui peuvent être mis en œuvre. Les outils de pilotage et les modes opératoires afférents sont décrits dans des fiches techniques synthétiques, qui renvoient à des documents plus complets

(1999). Editions Centre technique interprofessionnel des fruits et légumes, 223 p. ISBN 2-87911-108-0.

Urban Environmental Management: follow-up

The previous issue of *Industry and Environment* (Volume 23, No. 1-2) dealt with Urban Environmental Management (UEM). This is indeed an increasingly complex challenge, which is the reason for providing an additional perspective here.

Historically, cities have been the driving force in economic and social development. Urbanization is associated with high income, improved health, higher literacy, improved quality of life and other benefits. Yet along with the benefits of urbanization come environmental and social ills. These include diverse problems, from lack of access to clean drinking water to urban air pollution, greenhouse gas emissions, etc.

In addition to economic activity, major demographic forces underlie urban growth. Some of the chief forces driving urbanization today are the shifting of jobs from agriculture to industry and the concentration of economic opportunities in urban areas. The population in urban areas has been on the rise, as a result of an excess of births over deaths or net inward migration. The increasing population pressure on land resources leads to unsustainable land use practices, such as forest clearance, expansion on marginal lands, etc. As all these conditions still exist and are even becoming more severe, the rate of land degradation appears to be continuing to increase. Economic growth brings cities needed revenues, but if proper safeguards are not in place it all too often occurs at the expense of environmental quality. These cities, as a result, harbour huge populations of the urban poor, who are shut off from the benefits of economic growth.

With the bulk of the world's population shifting from rural to urban areas, poverty is becoming an increasingly urban phenomenon.

Several factors, including structural adjustment programmes, economic crisis, and massive rural-to-urban migration, have contributed to the increasing number of urban poor. Unemployment is a primary contributor to urban poverty. Poverty cannot be adequately described as just a lack of economic resources, or of access to basic needs. Poverty also involves relative deprivation or inequality in access to income and material goods and services – and, in most countries, income inequalities are wider in cities than in the countryside.

The urbanization of poverty has implications for the urban environment and quality of life. For one, the urban poor bear the greatest burden of urban environmental risks because of the situations in which they are forced to live – the sprawling squatter settlements. A large number of rural migrants are unwelcome additions to an already inflated urban unemployment situation. These migrants are forced to settle in slums and squatter settlements characterized by high population density and poor quality housing. Lack of water supply and sanitation facilities, lack of proper waste disposal, etc. lead to the spread of communicable disease.

Increased levels of consumption by the populations of urban areas lead to generation of copious quantities of wastes. The impacts of this pollution are experienced both locally and at great distances from the source. Domestic and industrial discharges contaminate air, land and water with toxins. These problems warrant major concern on three accounts. Firstly, the prevailing pattern and trend of urbanization is even more material and energy intensive; secondly, the discharge of pollutants in cities is particularly harmful because they are concentrated; and thirdly, the financial, institutional, technological and infrastructure systems available to help control these problems seem at present to be inadequate for the task. Finally, urban areas affect the environment in three major ways: conversion of land to urban uses, extraction and depletion of natural resources, and disposal of urban waste.

Environment and urban waste

Current solid waste handling and disposal practices result in several hazards. They promote the generation of microorganisms that cause diseases, attract and support diseases vectors, and produce noxious odours. Improper solid waste management causes air, soil and water pollution. Indiscriminate dumping of wastes contaminates surface and groundwater supplies. In urban areas solid waste clogs drains, creating stagnant water, insect breeding, and floods during rainy seasons. Uncontrolled burning of waste and improper incineration contributes significantly to urban air pollution. Greenhouse gases are generated through the decomposition of organic wastes in landfills, and untreated leakage pollutes surrounding soil and water bodies. These negative environmental impacts are mainly a result of improper solid waste disposal.

An effective, efficient and sustainable waste management system is still lacking in urban areas. Understanding the relationship between various waste activities makes it possible to create an Integrated Solid Waste Management (ISWM) plan, in which individual components complement one another. ISWM is defined as the selection and application of appropriate techniques, technologies and management programmes to achieve specific waste management objectives and goals. The generally accepted waste hierarchy is: Reduce, Reuse, Receive and Recover. Waste transformation needs physical, chemical or biological processing. The rest of collection, treatment and disposal can be reduced through various mechanisms.

UEM objectives for this strategy should be:

- prioritize waste avoidance over recycling, and recycling over the other forms of environmentally sound disposal;
- reduce non-avoidable waste as far as possible;
- maintain the content of hazardous substances in waste as low as possible;
- guarantee environmentally sound residual waste treatment and disposal as basic requisites for human existence.

Impact of transportation on urban environment

The rapid urbanization occurring around the globe means not only that more people than ever before will be living and working in cities, but also that more people and goods will be making trips to urban areas. How cities meet this burgeoning demand for urban travel has implications for these areas' environment, economic efficiency and livability.

In particular, transportation systems are a major contributor to the decay of the urban environment and the reduced quality of life in metropolitan areas, due to their contribution to atmospheric emissions, noise and risk of accidents. Besides, the transport infrastructure has vastly encroached on agricultural, forest and urban land resources, which are becoming increasingly scarce. There are instances of deforestation and significant loss of agricultural land caused by construction of transport corridors. Perhaps the most serious and pervasive impact of the construction of transportation corridors stems from the draining of resources from rural to urban areas, with the appearance of sprawling and unplanned urban settlements leading to numerous environmental problems.

Consumerism

Urbanization also has a profound effect on the amount and type of energy consumed. Along with population growth, economic development and industrialization, urbanization is one of the principal forces driving the global increase in global energy demand. Although traditional rural societies rely heavily on human and animal energy, and on nearby wood or fuel, urban societies today are characterized by their reliance on fossil fuels and electricity. These patterns of energy use lead to different environmental impacts.

Sustainable development and UEM

For sustainable development, one needs to meet the needs of the present without undermining the resource and ecological base of future generations. Cities are clearly central to meeting the goals of sustainable development. The majority of the world's population will soon live in towns and cities.

The main challenge of urban environment management is to seek new management approaches for all cities, in order to provide for the needs of urban residents and protect the environmental resources on which human life depends. A narrow focus on sustainable cities can lead to the idea that cities should draw on natural resources from within their immediate region, which seems increasingly at odds with globalization of the world economy.

***Charu Jain** and **Ashok Khosla**, Development Alternatives, B-32, Tara Crescent, Qutab Institutional Area, New Delhi, 110 016 India (tara@sdalt.ernet.in).*
Mr Khosla is a member of Industry and Environment's *Editorial Board.*

THE UNEP DIVISION OF TECHNOLOGY, INDUSTRY AND ECONOMICS

Current uses and development of natural resources, technologies and production processes, as well as urbanization patterns, have negative effects on human health and the environment. This is illustrated by unsustainable use of water, land and energy, air and water pollution, persistent and toxic bio-accumulative chemicals in the food chain, and other industry-related problems.

To have a healthy environment, we need to change how we produce and consume goods and services. This change involves revising and developing economic policies and trade practices, so as to integrate environmental issues in the planning and assessment processes.

UNEP's Division of Technology, Industry and Economics (UNEP DTIE) was created in 1998 to help decision-makers in governments, local authorities and industry develop and adopt policies and practices that:

- are cleaner and safer;
- use natural resources efficiently;
- ensure adequate management of chemicals;
- incorporate environmental costs;
- reduce pollution and risks for humans and the environment.

UNEP DTIE, whose main office is in Paris, is composed of:

◆ **The International Environmental Technology Centre (Osaka)**, which promotes the adoption and use of environmentally sound technologies, with a focus on the environmental management of cities and freshwater basins, in developing countries and countries in transition.

◆ **The Production and Consumption Unit (Paris)**, which fosters the development of cleaner and safer production and consumption patterns that lead to increased efficiency in the use of natural resources and reductions in pollution.

◆ **The Chemicals Unit (Geneva)**, which promotes sustainable development by catalyzing global actions and building national capacities for the sound management of chemicals and the improvement of chemical safety world-wide, with a priority on Persistent Organic Pollutants (POPs) and Prior Informed Consent (PIC, jointly with FAO).

◆ **The Energy and OzonAction Unit (Paris)**, which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition, and promotes good management practices and use of energy, with a focus on atmospheric impacts. The UNEP/RISØ Collaborating Centre on Energy and Environment supports the work of this Unit.

◆ **The Economics and Trade Unit (Geneva)**, which promotes the use and application of assessment and incentive tools for environmental policy, and helps improve the understanding of linkages between trade and environment and the role of financial institutions in promoting sustainable development.

UNEP

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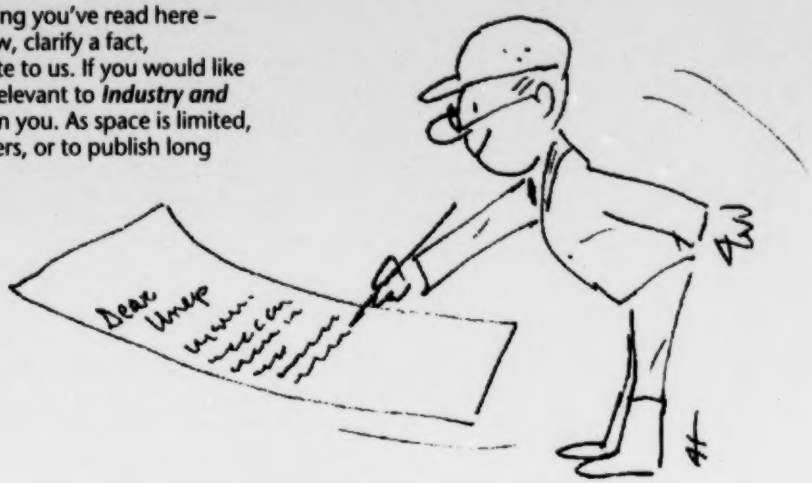

Industry and Environment

a publication of the United Nations Environment Programme
Division of Technology, Industry and Economics

For over 20 years, the quarterly *Industry and Environment* has provided a forum for exchanging information and experience. Articles are contributed by industry managers, government officials, researchers and others active in the field of sustainable industrial development. Besides reporting on developments of broad international interest, each issue focuses on a particular theme. The themes of recent issues have included environmental management of industrial estates, product development, industrial accidents, mining, voluntary initiatives, service industries, and the agri-food industry. For a list of past issues and their availability, contact UNEP DTIE or visit http://www.uneptie.org/hp_division_office.html.

The next issue of *Industry and Environment* will focus on transport.

Industry and Environment is an English language publication, but it often includes articles in French and Spanish. All contributed articles are accompanied by summaries in English, French and Spanish.

The review is also published in Chinese.
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